Products Finishing

CLEANING
PLATING
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FEBRUARY 1950

MEMO

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The services of our skilled technicians are always available to help you get precisely the form and size of design that you require. Submit your problem. Without cost or obligation to you we will be glad to make recommendations.

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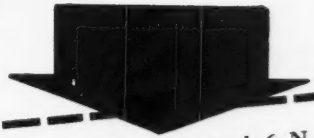
CHECK the Soil
CHECK the Metal
MAIL the List



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COMPANY .....

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- **Barrel cleaning**
- **Paint stripping**
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NORTON® ABRASIVES

G-218

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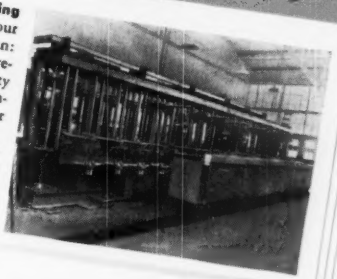

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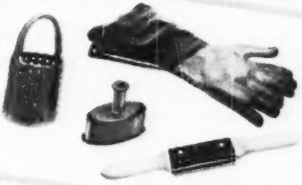

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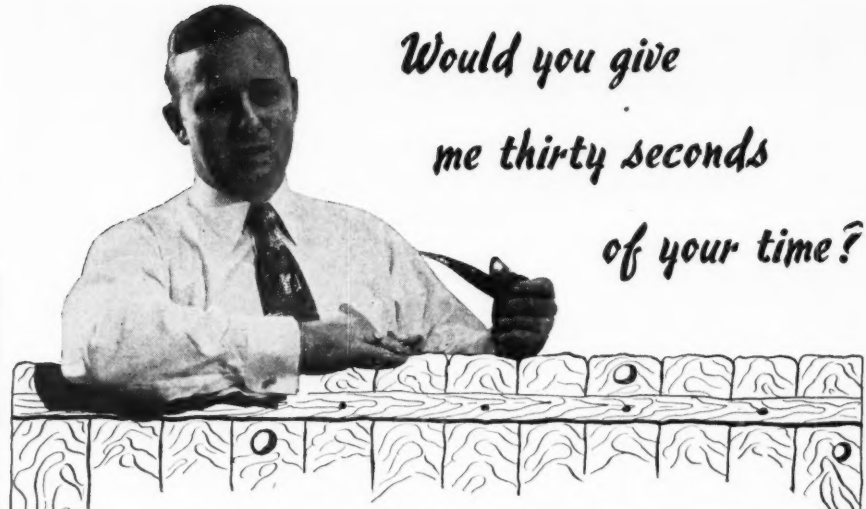

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Allow me to introduce myself. I'm Ev Hawthorne, Egyptian's Advertising Manager. I'd like to bring you a message about an *old* Egyptian product.

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Of course, it would be foolish to say 1-PA can do every priming job that comes down the pike, but we have seen very few instances where it did not do a magnificent job of protection against corrosion, or chemical attack.

This extremely tough, durable undercoat may be just what you need to give your product longer life and contribute a great deal to a more attractive appearance. Won't you inquire?

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Lafayette, Ind.

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ALLEN G. GRAY

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Advertising Manager

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Art Director

WILLIAM HARIG, JR.
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ADVERTISING REPRESENTATIVES

RICHARD S. KLINE
GEORGE E. HAY
431 Main St., Cincinnati 2
MAin 0182

G. M. FILLMORE
342 Madison Ave., New York 17
Murray Hill 7-7390

CHARLES H. DEILY, JR.
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THE ROBERT W. WALKER CO.
684 S. LaFayette Park Place
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Products finishing

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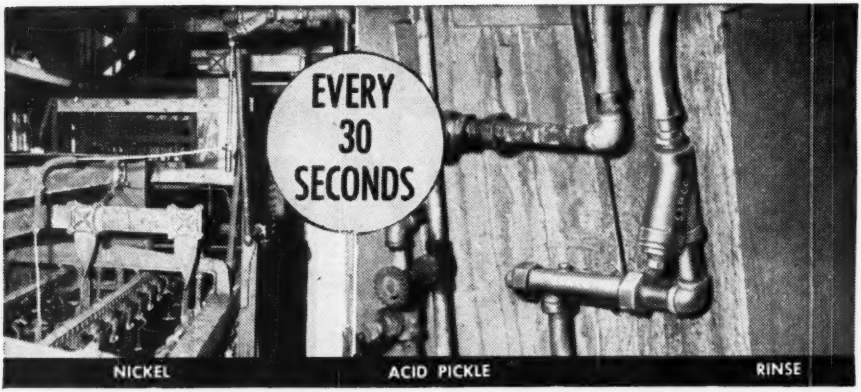
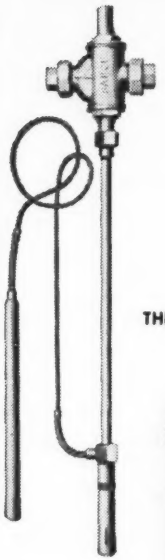


A Perfect Plating Operation



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THERMOTON

TR-22
CONTROL

Automatic plating units never wait. When they hit the tanks, the temperature must be right and in less than a minute the job must be done—right. In the busy plating plant illustrated, every step is temperature controlled—sometimes with the inexpensive Sarco No. 87 Trap-Control—at others with the more exacting TR-22 control.

The result is mass production with a high accuracy that is repeated, day in and day out. Reduction in the number of rejects paid for these controls in a few months. And the strange thing is that less heat is wasted when perfect plating is secured with Sarco Controls.

Eventually you will find your plant in competition with temperature controlled plating. Why not look into the question now and save the original cost of the controls over and over for years to come? The Sarco Representative near you will be glad to show you how. Ask for Sarco Catalog No. 650 on plating and finishing controls.

186

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Eversharp has the "write" answer...

in dust control systems . . . it's KIRK & BLUM!

In the above photo, operators are buffing fountain pens already filled with ink. Note redesigned hoods which keep room clean and free from dust.

Known as a manufacturer of precision writing instruments Eversharp finds "clean air, the invisible tool," essential to efficient manufacturing operations. On moving one of its plants to Middletown, Ohio, this concern called in KIRK & BLUM to modernize and enlarge the dust control system.

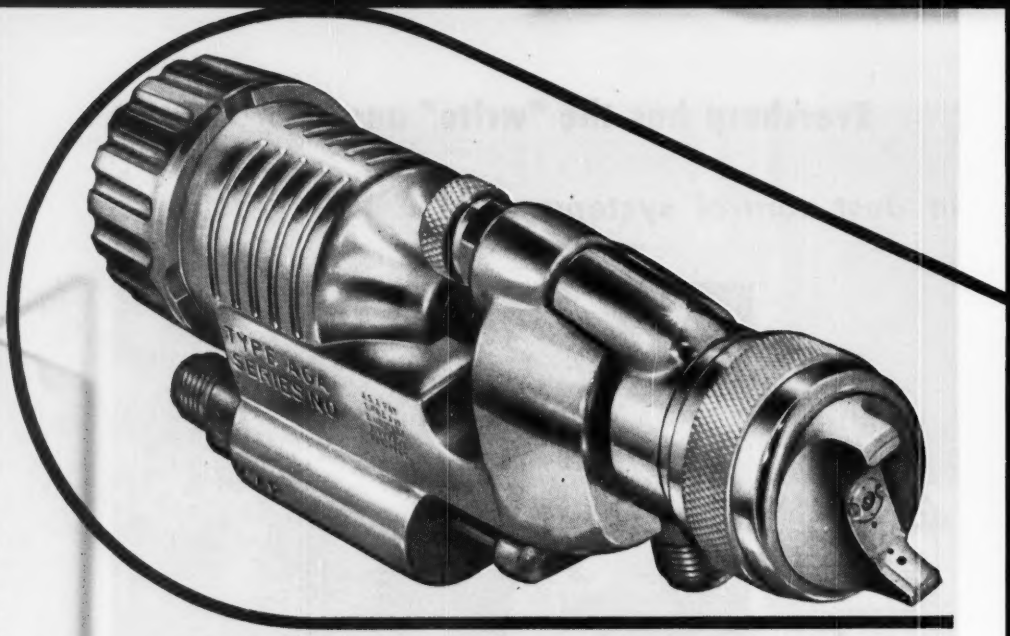
Among other changes, hoods on the buffing machine shown here were redesigned. Former bottom connections were used as traps and new connections were added at the top of the hoods. Note the compactness of hood arrangement and streamline suction piping in the limited space available.

Write for free catalog, "Fan Systems for Various Industries." The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati 25, Ohio.

On the roof of the Eversharp plant, KIRK & BLUM relocated an old collector for greater efficiency and installed this new collector.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM DUST CONTROL SYSTEMS



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Manufacturing costs drop, production increases when you put this Automatic DeVilbiss Spray Gun to work. Painting is more uniform and faster, and you get fewer rejects. DeVilbiss Automatic Guns never develop tired eyes and sagging muscles towards the shift's end.

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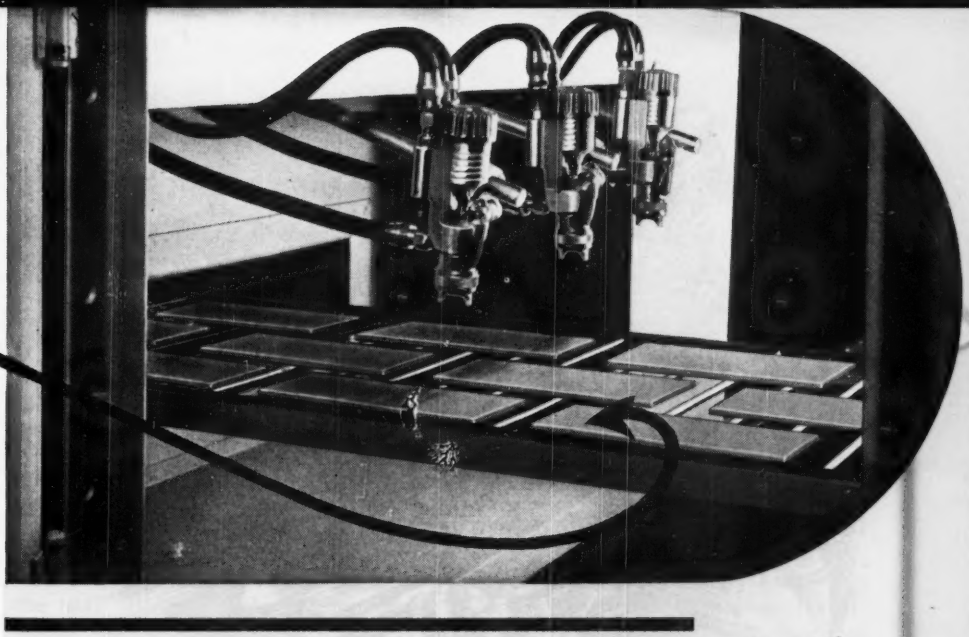
Practically any product made in production-line quanti-



ties can be painted better, faster, cheaper with an automatic set-up. DeVilbiss engineers will be glad to work with you and your production men to design efficient automatic finishing systems which speed production and lower costs. Write today for information.

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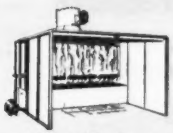
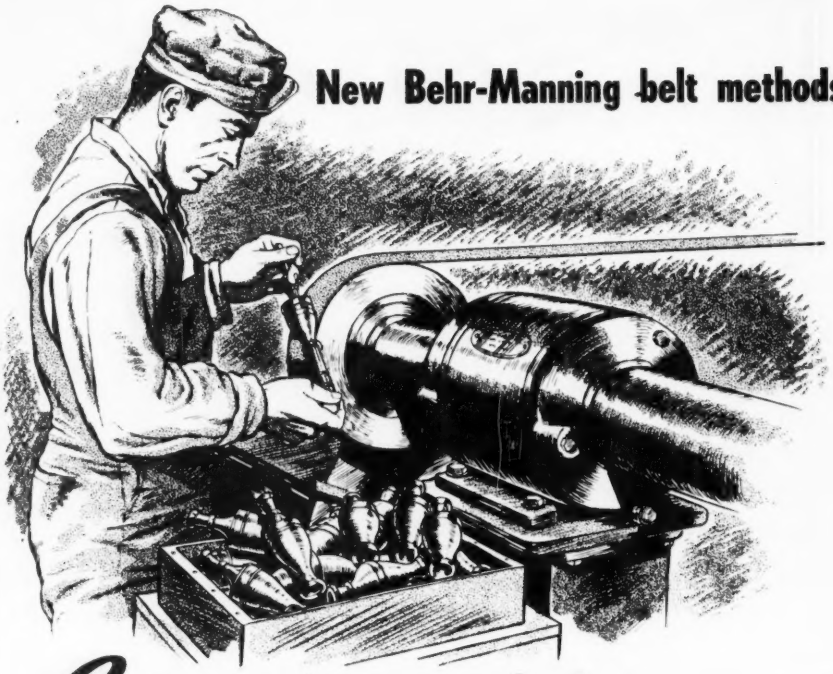


Exhaust Systems

Hose and Connections



New Behr-Manning belt methods

Cut contour polishing costs

Now you can polish contours with *fewer operations* and *without wheel marks*. And you can do an easier, superior buffing job after polishing — *no wild grain marks* to eat up production costs, labor and equipment time.

This new way of contour polishing has been developed by Behr-Manning application engineers, utilizing fast-finishing, cool-cutting flexible abrasive belts and special contact wheels.

See this method demonstrated in your own plant on your own work. Take this first step to gain an immediate production advantage on contour polishing operations.

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TROY, N.Y.

Use NORTON® abrasives sharpening stones

BEHR-MANNING, Troy, New York

I'd like to see a free demonstration of the new Behr-Manning contour polishing method.

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pf editorial

Vol. 14, No. 5

FEBRUARY, 1950

What Finishing Materials Do You Waste?

During the recent war, the manufacturer was plagued with a material supply condition best illustrated by the expressions: "rationing", "priority", "allocation", "substitute", and so on. In the period immediately following the war the material situation was reflected by such phrases as: "continues to be short", "gray market", "not obtainable", "production facilities insufficient", and so on. The scarcity of materials and supplies during that period was responsible for a somewhat altered attitude concerning their value, and every effort was made to use supplies efficiently and salvage such materials as could be recovered.

Certain manufacturers have made commendable efforts to conserve finishing materials both to reduce their overall cost of operation, and in the interest of conserving our national resources. Several of the larger paint users have installed reprocessing units to salvage overspray paints, lacquers, and enamels.

Suppliers of plating equipment have continually stressed the value of concentration rinse tanks to save valuable plating solutions, and have offered anode baskets to improve the degree of anode utilization. There are interesting possibilities involving the use of ion-exchange equipment for the recovery of certain metals from concentration rinse tanks, and the use of the salvaged products for solution makeup.

It is standard practice to reclaim a good percentage of the overspray porcelain enamel collected from spray booths.

One interesting and unexpected outcome of the present increased attention being given to industrial waste treatment is the recovery of some of the waste products in another form for use elsewhere. The recovery of certain useful products from waste pickle liquor is an example.

A critical survey of your finishing installation and process may bring to light several possibilities for recovery of finishing materials now being wasted, or lead to an investigation of more efficient finishing methods. In either case, such a survey will have been worth while.

E. A. Blount

Paint, Plating and Porcelain Protect and Beautify Display Cases

How different surface finishes are applied to various component parts which are assembled to produce Friedrich "Floating Air" refrigerators and display cases is described in this article.

By EZRA A. BLOUNT

THE PLANT AND THE PEOPLE

PF FEATURE

Manufacturing facilities for the 64-year old enterprise known as the Ed Friedrich Sales Corporation are concentrated in a three-story concrete-and-steel plant located in San Antonio, Texas. In the large, modern plant to which a 30,000 square foot metal fabricating shop and 2 large warehouses were added recently, some 600 employees produce Friedrich refrigerators for a national and international market.

The company has come a long way since the early days of commercial refrigeration ("piece of ice in a packing box") when in 1883, Ed Friedrich first began manufacturing commercial refrigerators, constructed of wood, difficult to clean, and uncertain in their ability to preserve foods. Progress toward the modern refrigerator with its perfected cooling and air conditioning units, its convenient arrangement and gleaming, enduring porcelain enameled surfaces, has been marked by many developments.

Ed Friedrich, founder and chairman of the Board of Ed Friedrich Sales Corporation, reads one of the many congratulatory messages he received on his 89th birthday, last February.

Improvements in which the Friedrich organization pioneered or to which it contributed include: development of refrigerators utilizing mechanical refrigerating units; development, in cooperation with motor manufacturers, of more compact and efficient compressors; adoption of improved construction into which was incorporated sound application of insulation principles; replacement of wood with porcelain enameled metal panels; application of air conditioning plus refrigeration to meat preservation in designing and perfecting the patented "Floating Air" system of refrigeration.

The company which he founded 67 years ago in San Antonio, still headed by Ed Friedrich as chairman of the board, who, although nearly 90

1
2
3
4
5

years of age, maintains an active interest in the enterprise and visits the plant every day to check progress made on new developments and plant improvements. Much of the work of the active management of the plant has now been delegated to Richard H. Friedrich, president, and George E. Friedrich, vice president, sons of the founder.

The production part of the organization is headed by Stuart Bergman as production manager. Mr. Bergman is also plant safety engineer and managing director of the "Friedrich Floating Air News," the monthly publication containing news about employees and company activities. Paul Brinkoeter, a veteran of 30 years' service with the company, is plant superintendent. Foremen concerned with finishing operations include Joe C. Brown, plating foreman, and Willie Wilks, porcelain enameling foreman.

Employee service records attest to the fact that Friedrich's is a good place to work. There are a number of 30-year men, 25-year men, and a larger number of employees with shorter service records among the 600 employees. Interest in the company and its products is stimulated by a number of management policies, among them an idea contest for improvement in design of the products, a suggestion program with appropriate awards for all good ideas, and awards of jeweled badges bearing the Friedrich insignia in recognition of long service. Badges differ in the kind and number of jewels; the three-year service badge has a ruby in the center; the thirty-year badge contains five diamonds plus a large solitaire diamond on the face of the insignia.

Regarding personnel policies, it is interesting to note that two nearly-blind persons are employed. One is a press brake operator and the other is a drill press operator. Mr. Bergman advises that these two employees are the most careful and safety-conscious men in the plant, and further states that both do creditable jobs.

THE PRODUCTS

Friedrich builds refrigerators for all commercial needs. They are built for grocers, butchers, bartenders, florists and bakers.

Probably the most widely used commercial refrigerator is the open, self-service refrigerator, designated as the Friedrich OPENVIEW Model OC10R (No. 3 on page illustrating several models).

Meat, cheese and other perishables are placed in this case, which is refrigerated by a patented air conditioning system, FloatingAir. The cold air is chilled by coils in the bottom of the case, out of the display and storage area, then gently floated to the top of the case and continuously circulated.

These open cases come in 12, 10 and

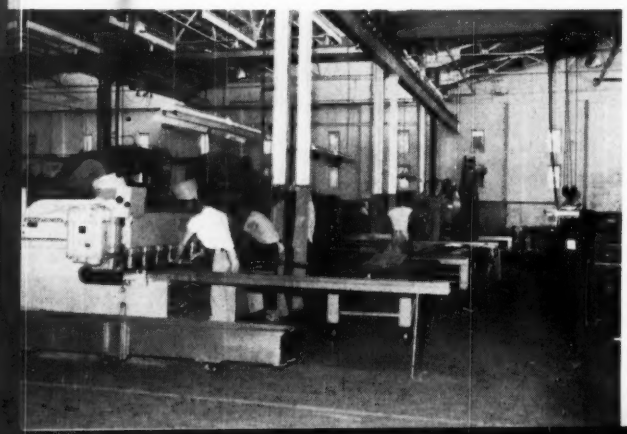


Fig. 1 — Fabrication of sheet metal components begins with the transfer of metal sheets from the neatly arranged storage area, the edge of which may be seen at the extreme right of this illustration, to the Cincinnati Shears shown in the foreground, and continues on through the well-lighted sheet metal department in direct, logical, straight-through process flow.

8-foot lengths. There are multiple shelf and multiple deck models to increase display space when floor space is limited. Friedrich pioneered in bringing out a 3-decker model, refrigerated on all three shelves.

Beneath the display area of the refrigerator on some of the models, are storage areas, with foot operated doors.

The ends of the open display cases are removable so that the cases may be lined up for continuous display.

The self service case is designed for mass selling. Open at the top, all the customer has to do is reach in and pick out what is wanted. Mirrors over the display increase the apparent size of the display area and hidden lighting by COOLITE brings out the color and sparkle of the display.

Shown as No. 2 on the second page of the article is Model OB8R 2-Decker Dairy Case. As in other OPENVIEW Speed-Line cases, the ends are removable for continuous lineup. No. 4 illustrates the Model OA8R Dairy Case. The triple Thermopane glass front keeps heat out and reduces fogging so that the merchandise is always in view.

In the development of the OPENVIEW Frozen Food Case (Model OF8R shown as No. 1) there was the technical problem of keeping the food at below freezing temperatures in an open case without accumulating excessive frost. Friedrich met the challenge by perfecting the NOFROST valve, an exclusive Friedrich feature. Whereas the frozen food case was plagued with the formation of frost from moisture, the fruit and vegetable cases, (as Model OV11R, designated as No. 5) must maintain a certain amount of moisture, lest the vegetables dry out and lose their freshness. Friedrich FloatingAir cases are designed with this in mind. The air is purified and humidified before it is floated over the vegetables.

For fruits and vegetables that should not be, or have no need to be refrigerated, as potatoes, bananas, and cocoanuts, Friedrich has a non-refrigerated Fruit and Vegetable Case which may be lined up with the refrigerated cases for continuous display.

The standby of the meat merchandiser is the Linevue Display refrigerator. A similar case is designed for the exclusive display of fish and poultry, with a glass separating partition.

Large walk-in coolers for meat and food storage are also manufactured by Friedrich. Some of these storage coolers are double duty, with shelves for reach-in self-service.

Bakers find a use for refrigerators in preparing dough for baking well in advance of actual baking time. By storing the dough in one of the four or five-door bakery refrigerators, bat-

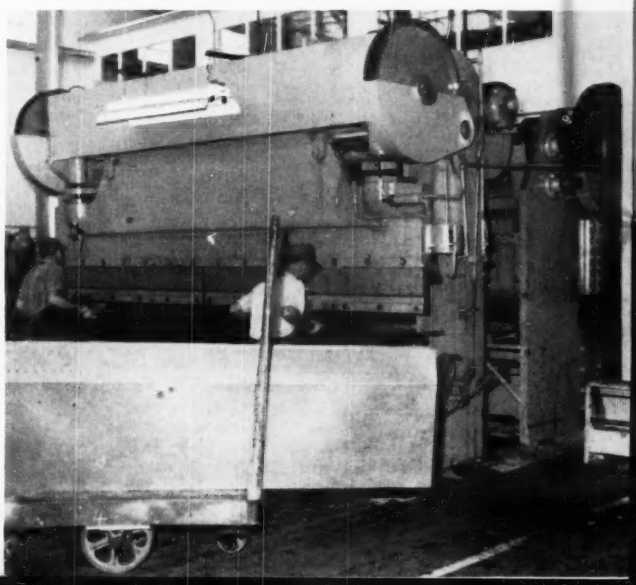


Fig. 2—Sheared metal parts are fabricated by a series of punching, bending, or forming operations, such as the forming operation carried out on the Chicago Press Brake, here illustrated.

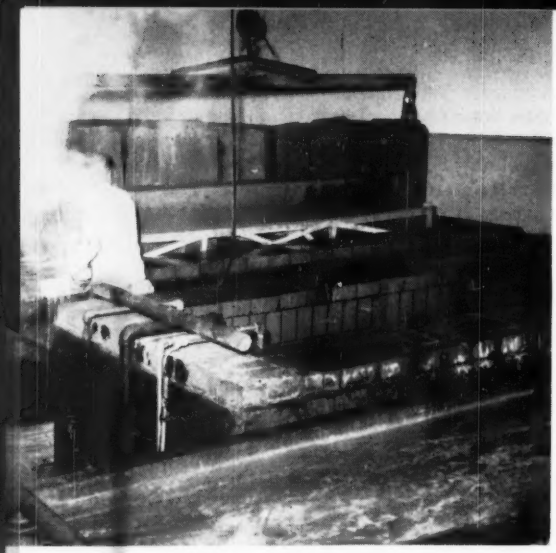


Fig. 3—Pickle room operator lowers a basket of cleaned parts into an acid tank for etching and roughening the surface of the metal. Note water spray skimmer on rinse tank in center foreground, and wood roller used to drain baskets of ware on the concrete-and-brick acid tank in the right foreground.

ters and doughs for pies, pastries, cakes and cookies are kept perfectly until needed and, after baking, have improved color, flavor and texture—besides staying fresh longer. Another feature of the bakery refrigerator is a cold water tap which bakers use to aid in producing a finer textured product.

The beverage trade also finds Friedrich refrigerators profitable. The dry bottle refrigerator will handle 26 cases in the 8-foot case, and 48 cases in the 12-foot case. This dry bottle refrigerator has the advantage of keeping bottles neater for serving without rusting caps, or losing labels.

For keg beer, there is a 2-keg direct-draw refrigerator. Beer is drawn directly from the keg, while the keg is kept chilled in the base of the serving cabinet.

Florists have come to recognize the advantage of displaying their wares under conditions which preserve their freshness. Friedrich has two models, the Display Front and Door Front.

The Display Front has a solid glass (triple Thermopane) front, giving a clear unobstructed view of the contents, and doors on the sides. The Door Front has the doors on the front (with glass, however) which provides easier access to the case.

FINISHING PROCESSES

Porcelain Enameling

Exterior and interior panels for Friedrich display cases, coolers, and other refrigerated units are fabricated from 16 and 20-gauge enameling iron in the sheet metal department, views of which are shown in Figs. 1 and 2. Fabrication is accomplished by a combination of shearing, punching, forming, and spot welding operations, after which the parts are transferred to the pickling room to be cleaned and prepared for the application of porcelain enamel.

In the pickling room, views of which are shown in Figs. 3 and 4, panels are loaded in 12-foot-long Monel metal pickling baskets and processed through a series of cleaning and pickling solutions, operated in tanks 13 x 3 x 4 feet deep of approximately 1150 gallons capacity, designed to prepare the surface of the metal for porcelain enamel. The operations are as follows:

1. Clean in one of two alkali cleaner tanks, each containing 8 oz./gal. Oakite 19, and held near boiling, for 15 to 20 minutes.

2. Rinse in cold running water tank equipped with spray skimmer on one end, and roller draining device (see Fig. 3).

3. Pickle in one of two acid tanks, each containing 7 per cent sulfuric acid held at a temperature of 150 deg. F. with Fulton Sylphon controls.

Pickling time varies from 3 to 10 minutes according to iron content of solution. When iron content reaches 5 per cent, the solution is discarded. The two acid tanks (shown in Fig. 3) are constructed from a poured concrete shell and lined with pitch over which are laid two courses of acidproof bricks, properly cemented in place. Heating of all the tanks is accomplished with steam conducted through heating coils of either wrought iron pipe (alkaline solutions) or Monel (acid solutions).

4. Dip in slightly acidified hot water rinse (160 to 170 deg. F.)

5. Immerse in a solution of 2 oz./gal. nickel sulfate, adjusted to a pH of 2.8 to 3.0 and held at 140 deg. F., for 10 to 15 minutes to form on the surface a nickel coating of approximately 0.05 grams per square foot. This adherent nickel coating promotes bonding of the porcelain enamel (a form of glass) to the steel sheets.

6. Neutralize in a solution of ⅜ oz./gal. sodium cyanide (background, Fig. 4).

7. Neutralize in a hot solution containing 0.08 oz./gal. borax and 0.21 oz./gal. soda ash (foreground, Fig. 4).

8. Dry in a brick, steam-coil-lined dryer fitted with fan for bottom exhaust (right foreground, Fig. 4).

Cleaned and pickled panels for refrigerators and display cases are transferred to the enameling plant proper where they are dipped in a water slurry of the ground coat or first enamel coat. This slurry is formed by grinding the enamel frit in water together with other necessary chemicals in huge ball mills until the fineness of the particles is such that only 6 to 10 per cent will be retained on a 200 mesh screen. This water slurry is adjusted by adding water or water solutions of Epsom salts or sodium nitrite until the consistency is such that panels dipped in the mixture will pick up or retain a coating (after drying) of 35 or 40 grams of enamel per square foot of metal surface (total both sides). Figure 5 is a view of a ground coat dip tank, showing how large panels are suspended for draining after dipping. While still wet, panels are placed on the pin-type conveyor, shown in the left foreground of Fig. 5, and conveyed through a gas-fired dryer where the water in the

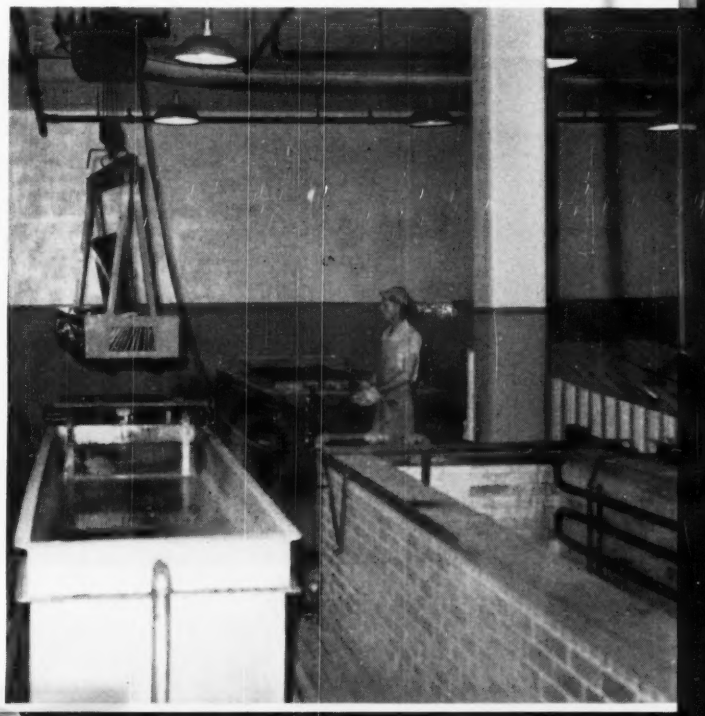


Fig. 4—Operating the remote-control electric hoist switch, operator transfers basket of pickled ware from cyanide neutralizer to soda-borax neutralizing tank shown in the center foreground. In right foreground may be seen the brick, steam-coiled-lined drying pit where neutralized parts are dried before being sent to the porcelain enameling department.

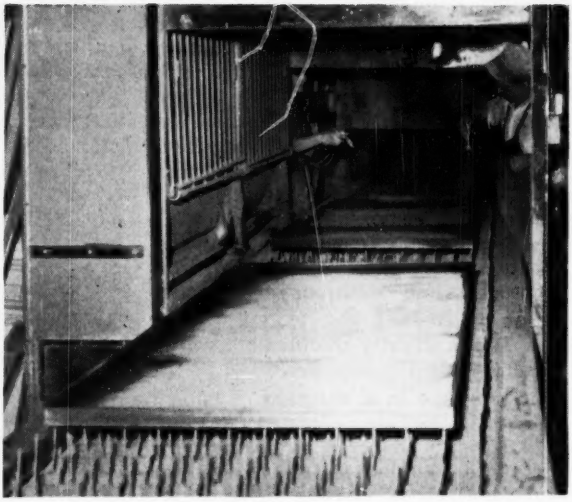
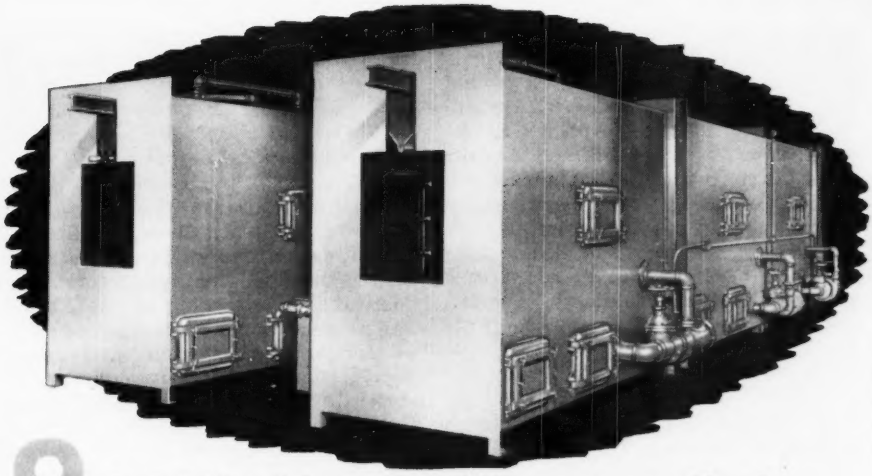


Fig. 6 — Ground coated and dried panels receive a spray coat of black enamel as they reach the discharge end of the drying conveyor. Panels to be finished in white enamel proceed through the dryer without receiving the black enamel coating.

enamel coating is evaporated, leaving an adherent, firm, dry coat. Panels which are to be finished in black enamel are sprayed with a coat of black applied over the dry ground coat as the panels emerge from the dryer and while they are still on the pin conveyor (see Fig. 6). The residual heat in the metal is sufficient to dry this black enamel coat. The panels are then fired for 5 to 6 minutes at 1560 deg. F. in Ferro gas-fired muffle furnaces to fuse the glass-like material to the steel and form a smooth, glossy coat over the entire surface.

Panels to be finished in white enamel are dipped in ground coat, dried, fired, and then sprayed with a water slurry of white enamel, as shown in Fig. 7. Spray guns and auxiliary equipment used in this process are somewhat like corresponding spray equipment used to spray paint, as can be seen from the illustration. Sprayed panels are placed in wooden slat drying racks,

Fig. 5 — Large refrigerator panels are dipped by hand into the ground coat enamel dip tank shown in this illustration, and then mounted as shown for proper draining of excess enamel from the parts. When draining is complete, panels are placed on the pin-type conveyor, shown in the left foreground, to be conveyed through a gas-fired dryer.



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dried in large room-type dryers, and brushed on the edges and around bolt holes so that neat borders of ground coat (blue-black) enamel will be revealed in such areas to form a pleasing contrast with the final white cover coat. After brushing, the panels are dusted to remove non-adherent enamel particles, and fired in gas-fired muffle furnaces, as shown in Fig. 8, at a temperature of 1520 deg. F. for 4 to 5 minutes. The smooth, glossy, completed panels are transferred to the final assembly department.

Electroplating

In the plating plant, views of which are shown in Figs. 9 to 13 inclusive, aluminum parts are anodized by the Alumilite process, steel frame parts are zinc plated and subjected to a subsequent "conversion" coating, copper parts are tin plated, and steel nuts, bolts, and similar parts are barrel plated with either zinc or cadmium for protection against corrosion.

Refrigerator parts such as trim strips, kick plates, meat platters, cooler doors, bottle box doors, handles, inner liners, and tracks, fabricated from sheet aluminum, are given a corrosion-resistant oxide coating by the Alumilite process. Some parts may be racked for processing immediately upon receipt from the fabrication department; others are first degreased in a Blakeslee Type V degreaser and then racked. The anodizing process consists of successive treatments in a series of 1000 gallon tanks as follows:

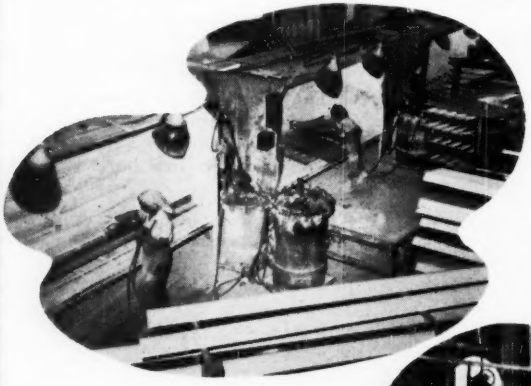


Fig. 7 (left)—Ground coated and fired panels are sprayed with white enamel in spray booths and placed in slat-type transport racks for drying, brushing, and transporting to the furnaces for final firing of the white coat.

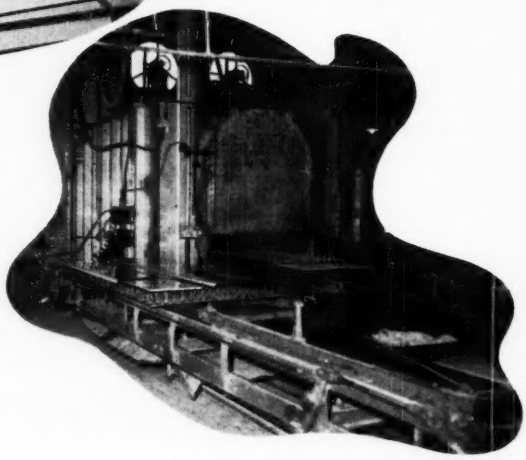
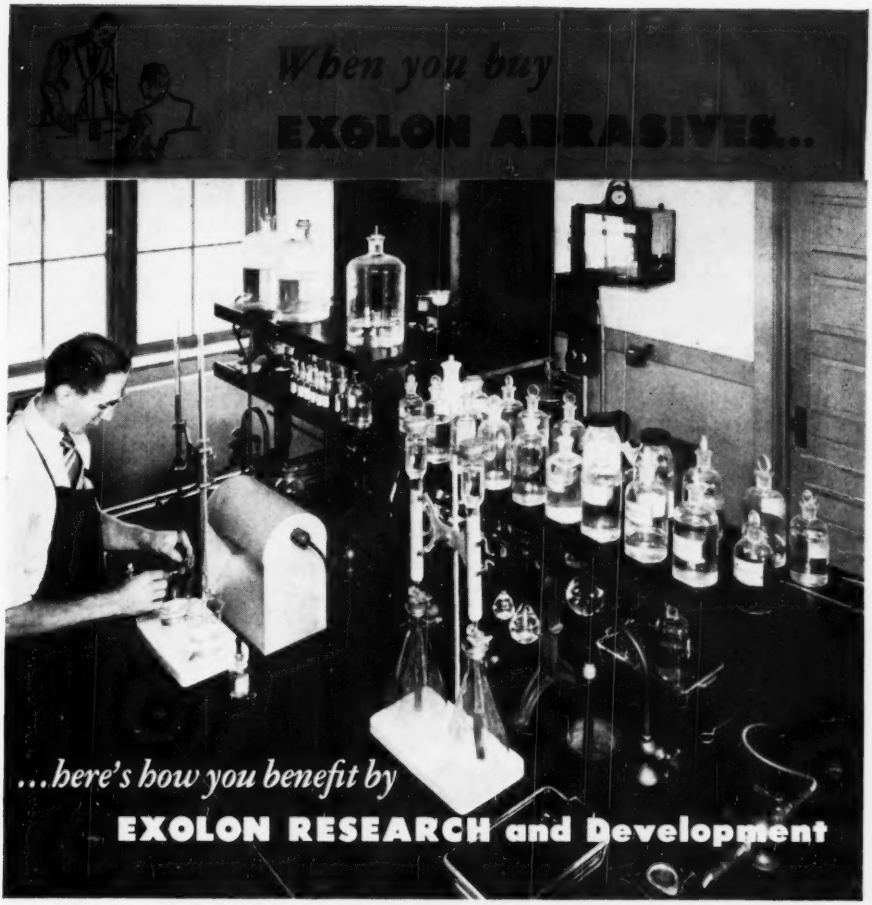


Fig. 8 (right) — Panels coated with white enamel (as well as ground coated panels) are fired in gas-fired box-type muffle furnaces to fuse the glass-like coating to the enameling iron. Illustration shows a load of panels being placed in the furnace with the aid of the "speed fork" charging device shown in the foreground.



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1. Clean and etch (see Fig. 9) in a 10-10.5 oz./gal. solution of Oakite 30 for 1-1.5 minutes. The solution is air agitated and held at a temperature of 160-180 deg. F. with the aid of a Fulton Sylphon temperature regulator.

2. Anodize (reverse current) for 30 minutes in 18 per cent sulfuric acid at 16-18 volts and 12 to 13 amp./sq. ft. current density. The solution is air agitated and held at 68 to 72 deg. F. by circulating refrigerant through lead cooling coils in the tank. The anodizing tank is wood, lead-lined, fitted with a wood grill work for protection of the lead lining from mechanical damage.

4. Rinse in a cold water spray rinse.

5. Immerse in boiling water for 30 minutes to seal or close pores of the anodic oxide coating. The water is maintained at a pH of 5.5 to 6.5 by the addition of sulfuric acid or caustic soda as required.

6. Unrack and transfer to final assembly.

Copper tubing and copper condensers, after being racked as shown in Fig. 10, are tin plated. Welding scale is first removed from condensers with aluminum oxide grit in a sandblast cabinet. The tin plating process is as follows:

1. Clean in a solution of 10 to 12 oz./gal. Oakite 90 operated at 200-210 deg. F. in a steel tank. The work is soaked in the solution for 5 minutes, after

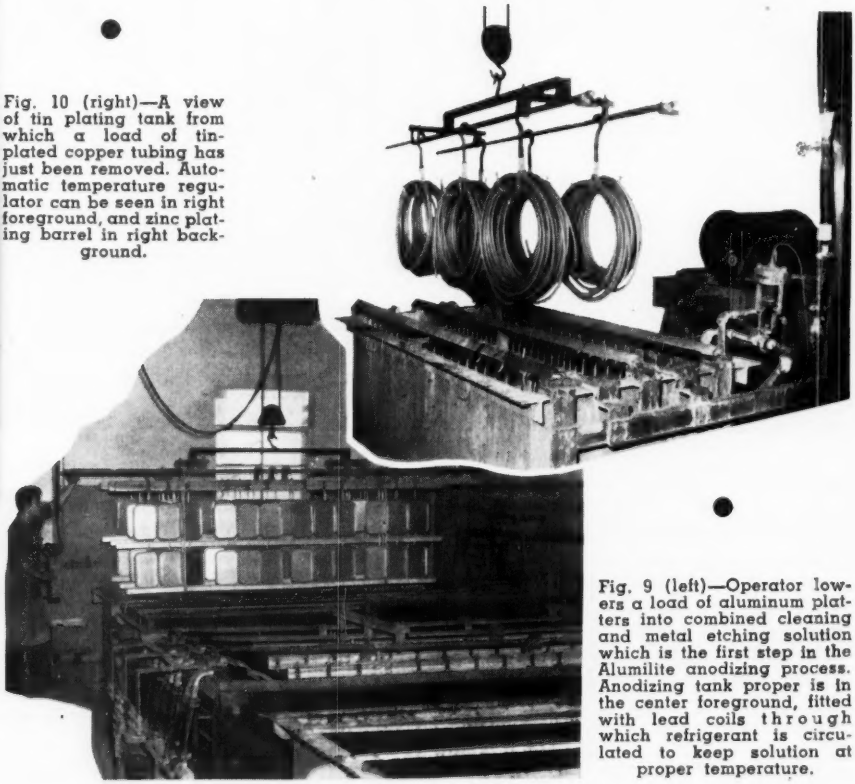

Fig. 10 (right)—A view of tin plating tank from which a load of tin-plated copper tubing has just been removed. Automatic temperature regulator can be seen in right foreground, and zinc plating barrel in right background.

Fig. 9 (left)—Operator lowers a load of aluminum platters into combined cleaning and metal etching solution which is the first step in the Alumilite anodizing process. Anodizing tank proper is in the center foreground, fitted with lead coils through which refrigerant is circulated to keep solution at proper temperature.

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which reverse current is used for 1 minute for electrocleaning.

2. Rinse in hot water rinse—overflowing—operated at 160 deg. F.

3. Dip for less than ½ minute in a cold solution of 30 per cent (by volume) hydrochloric acid held in a rubber-lined steel tank further covered with a protective wood lining.

4. Rinse in cold water.

5. Tin plate (tubing 10 minutes; condensers 20 minutes) in a Du Pont sodium stannate plating solution made up and operated in a steel tank as follows:

Sodium stannate	16 oz./gal.
Caustic soda	2-3 oz./gal.
Sodium acetate	2 oz./gal.
Hydrogen peroxide (100 vol.)	1/8 oz./gal.
or sodium perborate	1/8 oz./gal.
Temperature	140-176 deg. F.
Current density (cathode)	6-60 amp./sq.ft.
Current density (anode)	5-25 amp./sq.ft.

6. Rinse in cold running water.

7. Rinse in boiling water.

8. Unrack, transfer to assembly.

Zinc plating (see Figs. 11 and 12) of the steel framework parts for refrigerators, as well as wire shelves, turbine wheels, bakery box slides, braces, brackets, air chutes, blower housings, and concealed lock parts, accounts for most of the production of the plating plant. The zinc plating process is as follows:

1. Clean by sandblasting or degreasing according to the type of contaminant to be removed.

2. Clean in Oakite 90 as described in the tin plating cycle.

3. Rinse in hot water.

4. Dip in 30 per cent (by volume) muriatic acid.

5. Rinse in cold water.

6. Remove smut from acid dipping or pickling operation in a solution of 4 oz./gal. sodium cyanide and 2 oz./gal. caustic soda using reverse current at 4 volts for 1-5 minutes.

7. Zinc plate (Du Pont Durobrite) for 10-15 minutes in a solution com-

Fig. 11—The progress of a load of zinc-plated parts through rinsing and bright dipping operations is observed by Joe C. Brown, plating plant foreman, shown at the left in this photograph.

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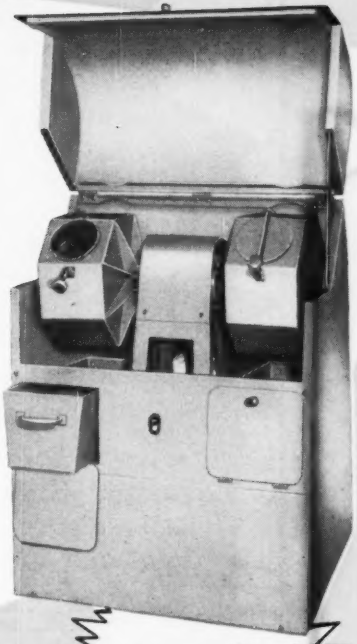

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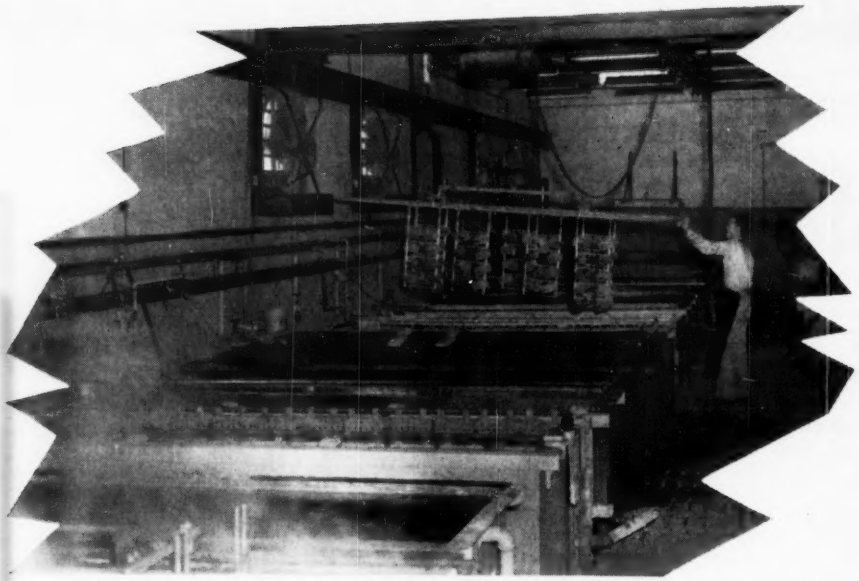

Fig. 12—A load of zinc plated parts, having received a "conversion coating," proceeds through the final rinses and dryer.

posed and operated as follows:

Zinc cyanide	8-12 oz./gal.
Sodium cyanide	5.6-8.4 oz./gal.
Caustic soda	10.4-16 oz./gal.
RH 309 brightener	⅛ oz./gal.
RH 774 anti-fume agent	1/30 oz./gal.
Current density	40—60 amp./sq.ft.
Temperature	75-100 deg. F.

(½ lb. RH-309 added daily to maintain brightness of deposit)

This solution is operated in a 1000-gallon steel tank as is the cleaner solution; all other tanks mentioned are of 800-gallon capacity.

8. Rinse in cold water.

9. Dip in ½ per cent nitric acid (bright dip), operated cold in a steel, pitch-lined tank.

10. Rinse in cold water.

11. Rinse in boiling water.

12. Dry in brick pit dryer, lined with steam coils, and fitted with an exhaust fan to pull wet air down through the pit and out the bottom.

Wire shelves, concealed lock parts, turbine wheels, and bakery box slides are zinc plated and then subjected to a Unichrome P 95 conversion coating for increased resistance to corrosion. Such parts are taken directly from the cold water rinse (step 10 in the preceding paragraph) and processed as follows:

1. Dip for 15 seconds in Unichrome P 95 solution operated at 90 deg. F. and air agitated. The 800-gallon solution contains 117 gallons of P 95 and is used in a tank constructed of concrete, 7 inches thick, lined with pitch, and further lined with a 4-inch course of acid-resisting brick.

2. Rinse in cold water—air agitated.

3. (Wire shelves only) Dip for 20-30 seconds in a 4 oz./gal. solution of sodium carbonate held at 120 deg. F. This treatment leaches out the dark color produced on the surface of the zinc plated item by the conversion coating, and produces a bright metallic surface finish. Leaving the work in the sodium carbonate longer than 30 seconds reduces the corrosion re-

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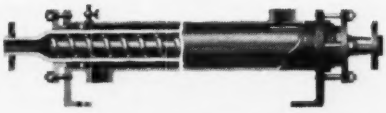

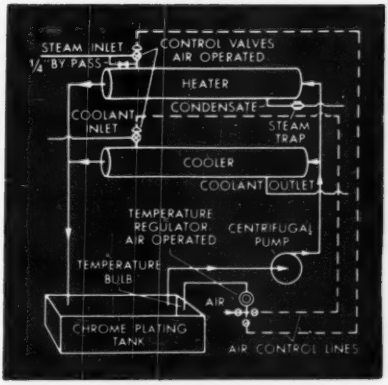

A sketch of a typical chrome plating installation showing use of Durco Heat Exchangers.

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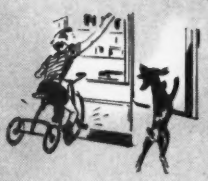

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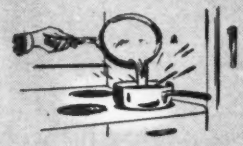

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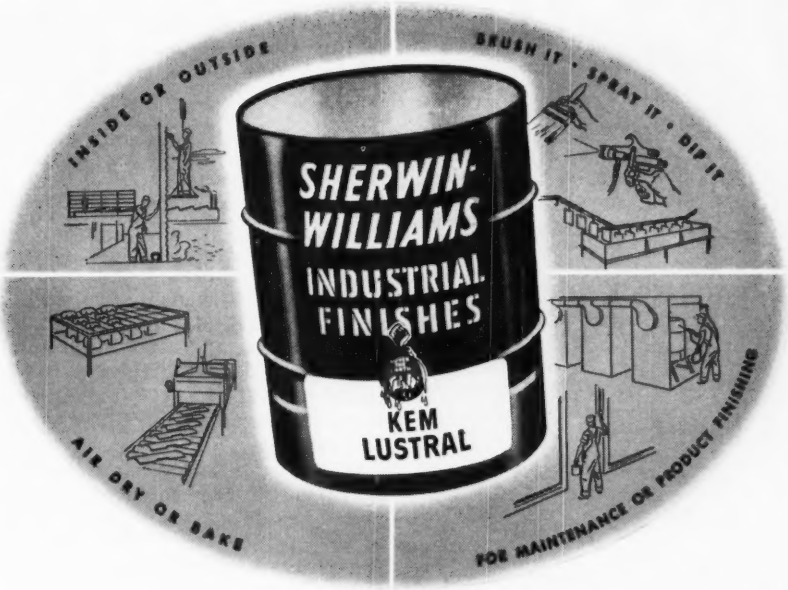

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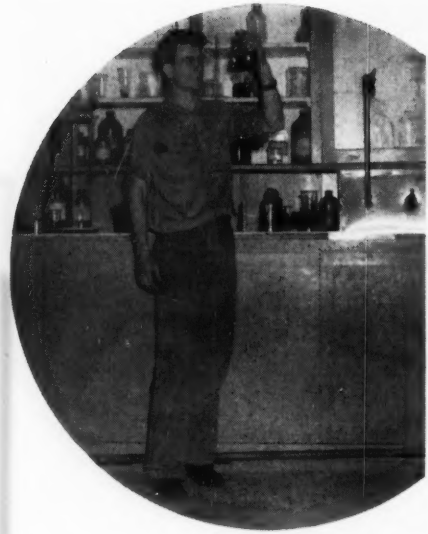

Fig. 13—Regular plating solution analysis is necessary to the proper functioning of the plating process. Joe C. Brown, plating foreman, performs the necessary chemical analysis in this laboratory which adjoins the plating plant.

sistance of the finish.

4. Rinse in cold running water.

5. Rinse in hot water.

6. Dry in brick pit dryer as previously described.

7. Dip in Unichrome clear B 132 dipping lacquer.

8. Bake at 250 deg. F. for 20 minutes.

Small parts such as bolts and nuts are zinc plated (after being cleaned and pickled) in a 16 x 30-inch Hanson-Van Winkle-Munning hard rubber plating barrel operated in a 200-gallon tank. The plating solution and operating conditions are as follows:

Zinc cyanide	12 oz./gal.
Sodium cyanide	8.4 oz./gal.
Caustic soda	16 oz./gal.
Durobrite brightener	⅛ oz./gal.
RH 774	1/30 oz./gal.
Current density	Maximum obtainable
Temperature	75-100 deg. F.
Voltage	9-15 volts

Power for the zinc plating barrel, which may be seen in the left background of Fig. 11, is supplied by a Westinghouse 12-24 volt, 300 ampere rectifier connected directly to the barrel. A normal load of 75 to 150 pounds of small parts is plated in the barrel in 20-30 minutes.

Small parts on which cadmium is specified as the surface finish are plated in a 14 x 24-inch plastic plating barrel operated in a 150-gallon tank (left foreground, Fig. 11). The plating solution contains 4 oz./gal. of Cadux No. 1 salts (Hanson-Van Winkle-Munning Company) and 12 oz./gal. sodium cyanide in addition to a small amount of Cadux brightener. A satisfactory deposit is secured in 30

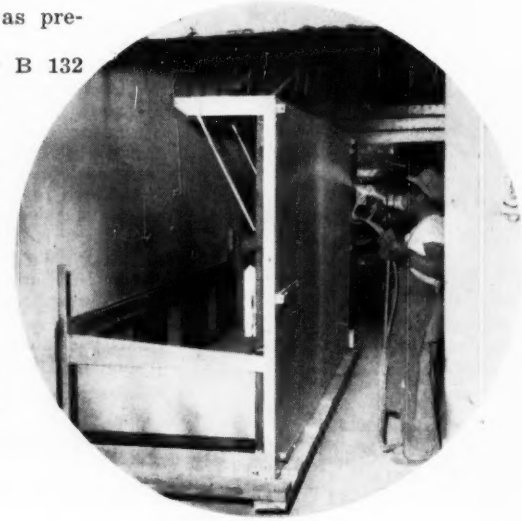

Fig. 14 — Refrigerator and display case back panels are spray-painted in spray booths such as the one here illustrated. Air-drying finishes are used for this operation.

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minutes' plating time. The usual cleaning and rinsing procedures are used.

Power is supplied to the tin plating tank, the electrocleaner tank, and the cadmium plating barrel from a 3000 ampere, 6 volt H-VW-M d.c. generator. A duplicate of this generator supplies power to the 1000-gallon zinc plating tank alone. A 40 volt, 2500 ampere generator supplies power to the anodizing tank.

As can be noted in Figs. 9, 11, and 12, an overhead tramrail crane is used to transfer large loads of work from tank to tank as the parts move from step to step in the process down the full length of the plating plant. A ¾ ton hoist, which may be seen in Fig. 10, is used for transfering work from the tramrail to some of the processing tanks not located in the main production line. A number of 36-inch fans, mounted along one wall (see Fig. 12) pull air across the plating plant and exhaust it to the outside, carrying out at the same time any undesirable fumes that may be present. An interesting detail regarding the engineering of this plating plant concerns the fact that the metal plating tanks are set in glass blocks joined with an appropriate cement to eliminate stray currents and accompanying plating difficulties.

Control of the various processes in the plating plant is assured by regular chemical analysis of the many solutions involved (see Fig. 13). Regular additions are made to keep the process operating at the peak of efficiency. Analysis plus observation also indicates when filtration, solution purification, or solution change is necessary. For example, to remove heavy metal impurities such as lead, copper, or cadmium from the zinc plating solution, it is necessary to treat the solution (every 2 weeks) by stirring in 20 lb. of zinc dust and 7 lb. of sodium polysulfide dissolved in approximately 15 gallons of water. After the solution has been stirred for two hours, it is allowed to settle overnight, after which the clear solution is filtered off through Filterbestos and activated carbon, and the sludge removed and discarded. The activated carbon removes organic impurities and completes the job of preparing the zinc solution for further useful production. Filtration and other maintenance operations are carried out with other plating solutions as required.

Fig. 15—Each refrigerator moves slowly down the line for completion, inspection, then to final testing, crating, and shipping.

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"Klem-Kote, used in a three-stage spray washer system, gives paint adhesion and salt spray resistance equal to, and in most cases superior to, other phosphate treatments in complex five and six-stage rust-proofing systems."

Klem-Kote cleans, conditions, rust-proofs, in one operation . . . eliminates extra stages . . . saves time, material, heat, labor. Here's a typical spray washer process, using Klem-Kote in *ordinary steel equipment:*

1. Klem-Kote at 1½ oz. per gal. water; temperature 170° to 180°F.; time, 1 minute.

2. Rinse.

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Simple . . . but effective . . . with non-toxic, non-fuming Klem-Kote leaving a fine, iridescent, crystalline, tightly-adherent, *complex* phosphate coating—a perfect paint bond! Eliminate complicated, costly, six-stage or inadequate three-stage systems you may now be using. Let Klem-Kote help you save, reduce rejects and improve the finish of your products.

There is a Klem Field Service Engineer in your area. Write now for complete information on how Klem-Kote can solve your particular finishing problem quickly . . . and economically.

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Fig. 16—Stuart Bergman, production manager, shown at right in this photograph, observes assembly operations being performed on large display cases.

Paint Finishing Processes

Back panels for display cases and other Friedrich products are fabricated from Armco Paintgrip steel zinc-coated and phosphatized sheets, or from galvanized steel stock which is subsequently treated with Oakite 36 to increase the adherence of the paint film to be applied and afford improved corrosion resistance. Backs are not painted, however, until they have been joined to the cooler frame, as can be seen in Fig. 14, which shows a cooler frame sub-assembly in position in one of the paint spray booths. A coat of white primer is applied to the back sections, after which a coat of Briner Paint Company semi-gloss air-dry lacquer is sprayed on and allowed to dry. In a similar manner shelf brackets, previously zinc plated and treated with the Unichrome conversion coating, are sprayed with Sherwin-Williams black air-dry lacquer. Compressors for the cooling units are painted, after assembly, with a spray coat of blue air-dry semi-gloss lacquer.

Since wood framing is used on some units, it is also protected with a paint finish in the form of a dipped coat of Kilrot wood preservative.

To prevent die and handling marks and scratches on stainless steel parts and some aluminum parts, flat sheets of the metal stock are protected with a spray coat of "3M" Strippable Coating, a plastic material which dries to form a shock absorbent and abrasive-resistant film. The coating can be easily peeled off the formed parts after fabrication and prior to spot welding or further finishing.

Panels, parts, and sub-assemblies progress through the various finishing departments described above and proceed to the final assembly department to meet the many other materials and products which go to make up the complete cooler or display case. Figures 15 and 16 are views of sections of the assembly department where Friedrich products take final form prior to shipment to far distant points. The acceptance of these products in the commercial refrigeration field is such as to justify the pride of the Friedrich organization in the painstaking craftsmanship and high grade materials used in their construction.

When a car owner takes his automobile into a competent refinishing shop, the car is first "bumped out" and sanded. Then the refinisher sprays on a tough, protective undercoat, which inhibits rust or corrosion, and builds a uniform foundation. This is the same quality of undercoating which was applied to this automobile when it was built. Over this, the final finish is applied.

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Stevens Regular Greaseless is compounded in four grades C, M, F and FF (Coarse, Medium, Fine and Finest) for use on wheel or buff in finishing base metals. Stevens "BRUSH FINISH" grade is especially adapted for use on plated surfaces.

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This advertisement is based on facts from the Lowe Brothers Case History Files.

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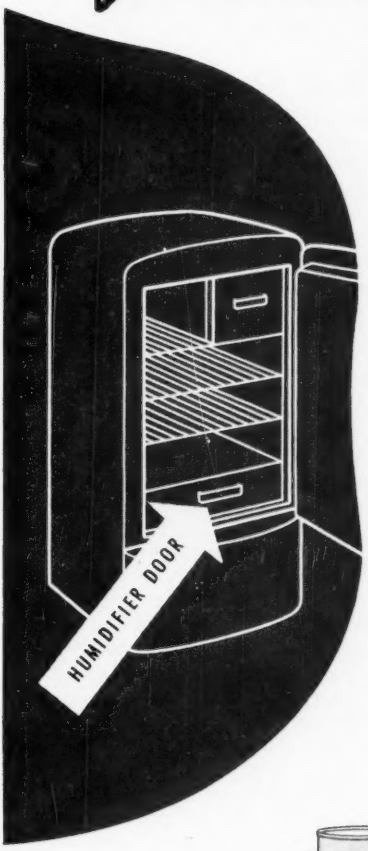

When a large refrigerator manufacturer was recently faced with the difficulties of finishing a polystyrene humidifier door, counsel with a Lowe Brothers "Finishing Specialist" led to the development of a new product—Lowe Brothers *Lacquer Finish*—which solves *all* the old problems of finishing plastic products!

The humidifier door required a finish that would *adhere* to polystyrene, yet, would not etch the surface—one that would stand up under conditions of constant humidity, resist foods, greases, juices and soaps. *This Finish* answers every requisite. Moreover, it can be made in *any* color; sprays on easily; dries in 10 minutes (quicker still if force dried) to a good, smooth gloss. From every standpoint, new *Lacquer Finish* is both practical and economical in use!

Development of this new finish provides a perfect example of the way manufacturers *everywhere* are benefiting by the services and suggestions of Lowe Brothers "Finishing Specialists." Their thorough knowledge of finishing methods and materials may lead to better finishing *results* for *you*. Why not talk it over? No cost or obligation. Write today.

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FINISHES FOR INDUSTRY

A Study of Heat Resisting Finishes

By GEORGE BLACK

ALTHOUGH the majority of doctors still stick to their theory that baldness is hereditary, a pretty good proportion of hairless finishing department heads can be traced directly to the words "heat resistant finish" specified on a production order or an engineering blueprint. Until very recently, few people were concerned with just how much heat a heat resistant paint had to withstand, and it was not until repeated service breakdowns started dipping into profits that any real interest was generated. Even at this writing, with the world seeing its greatest production advances in the industrial finishing field, the finishing foreman has a difficulty in choosing the best (which means the most economical finish which will do the job satisfactorily) finish for a particular part.

It has been the author's experience that the finishing foreman is very often unaware of the atmospheric conditions, temperature variations and cycles, and other service situations which the part must face. In light of this limited information and the negligible data available, the magnitude of his problem becomes all the more evident.

It is the purpose of this article to discuss the work and findings of the Houston Paint and Varnish Production Club, as published in the "Official Digest" of the Federation of Paint and Varnish Production Clubs. These reports are among the first to make public large scale comparison checks of heat resistant finishes under a vavariety of service-type conditions. Although they fall far short of perfection and leave the foreman in about the same spot as he was before, they point in the right direction and may act as a stimulus toward the setting up of those much needed standards.

Any report of this nature must settle at the outset certain specific problems such as (1) the definition and limitations within which the study will be made, (2) the types of tests which will be used, and (3) the extent to which these tests will be carried out.

Cognizant of this responsibility for outlining their study in advance, the Houston Club defined the term "heat resistant finish" as meaning "any coating, organic or inorganic, which could be applied to properly conditioned metal surfaces by any of the methods common to the paint industry, such as brushing, spraying, dipping, and troweling. The coating should also possess the qualities of forming a film and of protecting the underlying metal surface from corrosion." This definition was limited to cover temperatures between 250 and 800 deg. F., with the understanding that if any of the formulations tried successfully withstood the 800-degree

temperature, the test would be continued until the point of failure was reached.

The choice of the type of test was a bit more difficult. Study of the available literature revealed that no satisfactory device for laboratory testing of resistance to high temperatures had been worked out. After experimenting with sand baths and various other methods and devices, the Club finally developed a novel-looking standpipe type of apparatus, as shown in Fig. 1, which allows the operator to observe the manner in which each finish reacts to a gradual increase in temperature, and to compute the point at which each one becomes valueless as a protective coating.

Fig. 1—Apparatus for observing finish reaction to gradual increase in temperature and for computing point at which finish becomes valueless as a protective coating

The unit consists of two concentric pipes hanging vertically. The inner pipe serves as a baffle to direct the flame against the outer member, and, after reaching the red heat stage, acts as a source of radiant heat which helps to increase the temperature of the outer pipe still further. Procedure for testing includes sandblasting the outer pipe and coating it longitudinally with strips of the finishes to be tested. After providing the proper air dry or bake for each of the finishes under test, the pipe is placed in position and a regular Fisher burner, adjusted for a 4 to 6-inch blue cone, is placed directly beneath the pipes. In the middle of the test run, distilled water is sprayed over each finish to determine the effect of rain.

With the definition of what was going to be investigated clearly outlined, and the test apparatus decided upon, the problem of "extent" had to be considered. It was decided by the Club to study the work of previous investigators; to evaluate present-day products and ideas; and, if neither of these revealed anything of value, to formulate their own finish having the desired qualifications to be used as a standard.

In the Club's study of available literature, the conclusion was reached that up to the time of the last war, there were no satisfactory finishes for surfaces heated above 600 deg. F., and that the investigators concurred in stating that films composed of organic binders are valueless at temperatures between 600 and 800 deg. F. under prolonged heating. Such being the case, it was decided to use the comparative rather than absolute method of evaluating heat-resisting qualities, and it was felt that the ideal finish would be found outside the realm of carbon-organic type coatings. The Club agreed that no finish would be subjected to weathering tests unless it first demonstrated the ability to withstand the heat requirements.

In the search for the standard or control finish, a study was made of those paints meeting the following specifications: (1) Army-Navy Aeronautical, AN-TT-E-501, Enamel-Heat Resisting, Glyceral Phthalate, Black; (2) Bureau of Ships 54 P22 (INT) Paint, Inside, Semi-Gloss White; Fire Retardant; (3) Navy 52 VIe Varnish, Asphalt; and (4) Federal TT-P-641 Primer; Paint; Zinc Dust-Zinc Oxide.

None of the above coatings was found heat resistant at 800 deg. F. All of them disintegrated, burned off or flaked off the pipe stand at tempera-

tures between 500 and 600 deg. F. After many tests of a wide number of compositions, the standard was finally found. It consisted of an aluminum paint composed of 1 pound 10½ ounces of Heat Resisting Aluminum Bronze Powder to a gallon of vehicle. The vehicle was made from Silicone Resin No. 801, reduced to 50 per cent non-volatile with xylol. Made in ready mixed form, this paint proved to have excellent stability and leafing even after a year's storage. It remained intact at the 1,000 deg. F. position on the stand after more than 40 hours of heating and seemed unaffected by the water spray.

From this point on the "study" consisted of testing approximately 50 conventional coatings, choosing those which met the standard for heat resistance, and then subjecting the chosen formulations to weathering tests. Of all the coatings tested, only four formulations successfully passed the heat tests. These are listed in Table I.

The next step was the weather testing of these four coatings. Each coating was applied to a 6 x 8-inch sandblasted panel and dried for twenty four hours. After a series of 5 eight-hour heat cycles, the test panels were exposed on a test rack in Houston, Texas, at 45 degrees to the South.

Of the four coatings, the one last listed in the table showed about a dozen small rust spots after 5 months of exposure. The others failed badly in a matter of weeks. It is difficult, on the basis of this data, to say that any of the tested materials is satisfactory for conditions which combine heat and exposure.

Among the questions which have to be studied are the effects of temperature cycles, the effect of high heat cycles during exposure, the role played by the condition and/or the material of the undersurface or base, and

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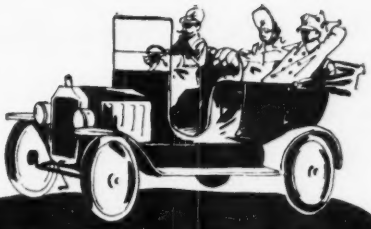

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Table I—Formulations Successfully Passing Heat Tests

VEHICLE	PIGMENTATION	FAILURE TEMP.	TIME
(1) Silicone Resin No. 801	Heat Resisting Aluminum Powder	1150° F.	30-40 Hours
(2) Proprietary Paint	Not Given	1150° F.	30-40 Hours
(3) Refined Linseed and Fish Oils Bodied Together	Zinc Dust Zinc Oxide Graphite	950° F.	30-40 Hours
(4) Silicone Resin No. 801	Zinc Dust, Zinc Oxide, Graphite	950° F.	30-40 Hours

Table II—Simplified Table for Specifying Finishes Meeting Required Temperature and Weather Conditions

GROUP	TEMPERATURE RANGE	TIME TO DESTRUCTION	WEATHERING CHARACTERISTICS	COST/GAL.	TRADE DESIGNATION

NOTES:
Group: Designated by letters of the alphabet or Roman numerals, these demarcations should set off predetermined ranges of serviceability.
Temperature Range:
Given in degrees Fahrenheit or Centigrade; it should indicate the maximum temperature at which the material can be satisfactorily employed. The temperature range, closest to the maximum, which will afford the longest service life should also be included.
Time to Destruction:
Given in hours; it should indicate the maximum life which can be expected from service within the preferential temperature range.
Weathering Characteristics:
This information should include performance under exposure both at normal temperatures and under the recommended temperature range.
Cost/Gal.: This item is self-explanatory.
Trade Designation:
This column should include the trade name of the product, as well as the name and location of the manufacturer.

so on. In addition, heat resistant finishes should be divided into groups and a standard specification set up so that the finishing foreman can tell at a glance which finish will meet the temperature and weathering conditions required. A table such as that referred to as Table II would enable rapid determination and simplified finish specification.

Radioactive Tracers Used To Study Plating Process

A BETTER understanding of the mechanism of electrodeposition in chromium plating has resulted from recent studies[1] by Fielding Ogburn and Abner Brenner of the National Bureau of Standards using radioactive tracer techniques. By tagging either

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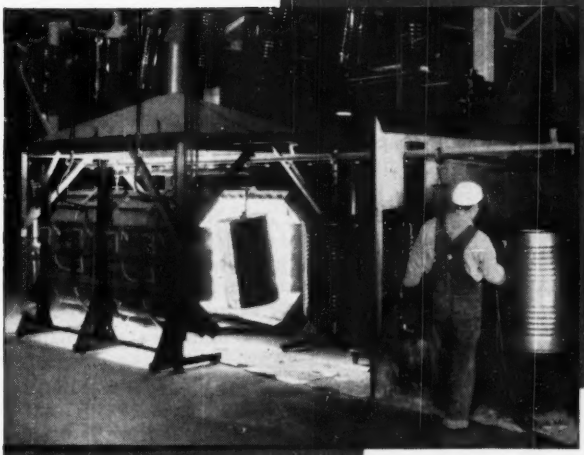

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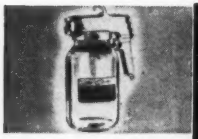

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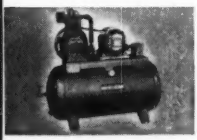

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the trivalent or the hexavalent chromium ion in a chromic acid plating bath with radioactive chromium 51, it was conclusively shown that metallic chromium is deposited out of the bath from the hexavalent state rather than from the trivalent state, as had previously been suggested. In addition to solving a long-standing problem in electrochemistry, the Bureau's work has demonstrated the utility of tracer methods as a tool for research on industrial plating processes.

For commercial chromium plating, the chromic acid bath, first reported in 1856, is at present practically the only chromium plating solution in use. This bath is prepared by dissolving chromic acid anhydride (CrO_3) and a little sulfuric acid in water. Initially, all of the chromium in the solution is in the hexavalent state; but when the plating current is applied, an excess of some trivalent chromium is formed by reduction of the hexavalent chromium at the cathode. This has led to investigations into the mechanism of the electrodeposition process to determine whether the chromium is deposited directly from the hexavalent state or through the trivalent form. Several supporting arguments have been advanced by advocates of each theory of chromium deposition, but until now neither hypothesis had been conclusively proved. The National Bureau of Standards therefore undertook to determine experimentally the source of the electrodeposited chromium by use of radioactive tracers.

Five chromic acid plating baths were prepared, and a small quantity of radioactive trivalent chromium was added to two of the baths as chromic chloride ($CrCl_3$) while hexavalent chromium was added to the other baths as radioactive chromic acid anhydride (CrO_3). Chromium deposited from the first two baths was inactive. On the other hand, deposits from the baths in which the hexavalent chromium was tagged were found to

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be radioactive, and their activities were close to those of deposits from a bath containing active hexavalent chromium and no trivalent chromium. It was thus evident that the metal is deposited from the hexavalent rather than the trivalent state.

The solution of radioactive chromic chloride was prepared from small pellets of chromium metal containing a minute quantity of chromium 51. The pellets were weighed and dissolved in hydrochloric acid. Excess acid was removed by evaporating to dryness, and water was added to the residue.

Radioactive hexavalent chromium was prepared by adding hydrogen peroxide and sodium hydroxide or ammonium hydroxide to a portion of the solution of active trivalent chromium and heating the mixture on a steam bath. When all the chromium had been oxidized to chromate, the solution was evaporated to dryness to remove excess ammonium hydroxide and hydrogen peroxide. The residue was then dissolved in water.

The deposit from the plating bath was made on brass tubes 1 inch in diameter and 10 inches long. Each tube was supported vertically inside a cylindrical porous cell within a liter beaker. The anode was a cylindrical sheet of lead that fitted the inside wall of the beaker. The porous cell served to prevent anodic oxidation of trivalent chromium during the electrolysis. Chromium was deposited at a current density of about 30 amp./sq. dm. (278 amp./sq. ft.) for intervals of 5 to 7 minutes, and the weight of the deposit was determined by weighing the cathode before and after plating.

Chromium 51 is a soft gamma ray emitter with a half-life of about 26 days. Its radioactivity in the solutions and the deposits was measured by means of a thin-walled glass gamma ray counter connected to a scaler. At the end of the plating process the Geiger counter was placed within the brass-cylinder cathode and the activity of the deposit was counted for 30 minutes. The tube was then rotated through 180 degrees, and counting was continued for another 30 minutes. A background count was also made with an unplated brass tube for the same period of one hour and was subtracted from the count for the

Mrs. Lee Couch of the Bureau staff is shown placing a Geiger counter inside a tube upon which radioactive chromium 51 has been deposited. The counter and radioactive tube are kept within the radiation shield of lead bricks (right) while the amount of gamma radiation emitted by the deposit in a given time is recorded on the scaler (background) attached to the counter.
(Photo courtesy National Bureau of Standards, Washington 25, D.C.)

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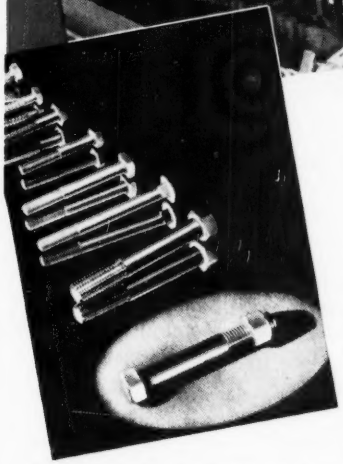

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In the Parco Cleaner line there's bound to be one that's especially suited for your requirements. A production test with the Parco Cleaner that fits your need will save you money on cleaning. Write today!

- **Emulsion and Solvent Type**—Excellent for removing oil, grease and soil from metal surfaces. Spray and immersion types.
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Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

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BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant
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plated tube.

Isotopic exchange frequently takes place between different valence states of the same metal. Had it occured in the Bureau's investigation to any appreciable extent, it would have resulted in the presence of sizable quantities of both active trivalent and active hexavalent chromium in the plating bath, regardless of which was added. This would have made it impossible to draw any valid conclusions from the experiment. It was therefore necessary, before performing the experiment, to determine the extent to which isotopic exchange takes place between trivalent chromium and chromic acid in the plating bath.

A stock solution containing both trivalent and hexavalent inactive chromium ions in fixed proportions was divided into the parts. To one part, active hexavalent chromium was added as chromic acid; to the other, active trivalent chromium was added as chromium chloride. These solutions were kept at 50 deg. C. for one hour, and at intervals 5-ml. samples were taken from each solution. The hexavalent and trivalent chromium in each sample were separated chemically, and the activity of each fraction was measured. The activities of the two fractions of each sample showed that at the end of an hour a small portion of the tracer had undergone an isotopic exchange, but not enough to interfere with the investigation.

—National Bureau of Standards Technical Report 1399.

[1]For more complete details, see "Experiments in chromium electrodeposition with radioactive chromium," by Fielding Ogburn and Abner Brenner, J. Electro Chem. Soc. 96, 347 (1949).

Titanium dioxide is one of the most recently introduced of the important white pigments used in the manufacture of enamel and paint. Titanium takes its name from the Greek word, "Titanes", which means "sons of earth".

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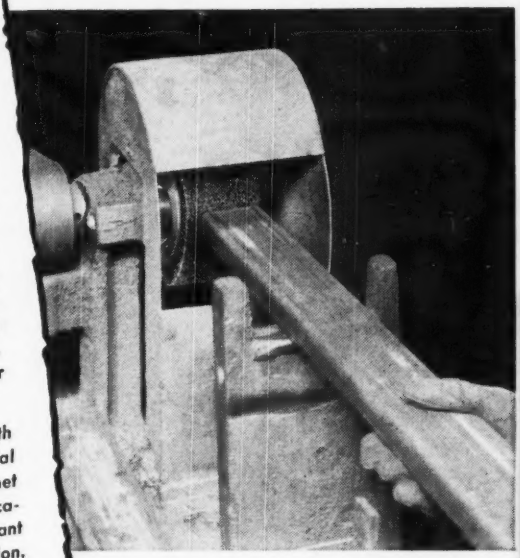

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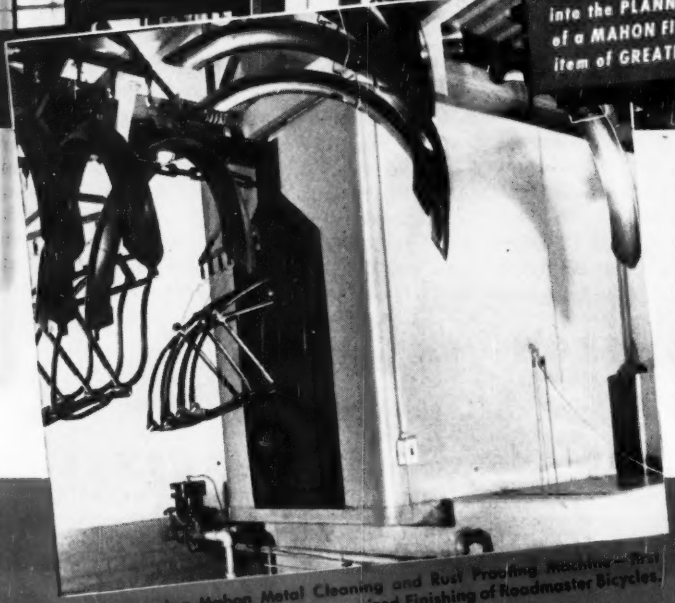

Parts entering Mahon Metal Cleaning and Rust Proofing Machine—first operation in the continuous conveyorized Finishing of Roadmaster Bicycles.

At right above: Bicycle parts emerging from the Mahon Dry-off Oven. The Mahon Five Stage Metal Cleaning and Rust Proofing Machine is visible at the left. Above: Mahon Flow Coating Machine with enclosed drip zone and tunnel to Finish Baking Oven at extreme right. Both Flow Coating Machine and Baking Oven are located over head to permit use of manufacturing floor space below.

M

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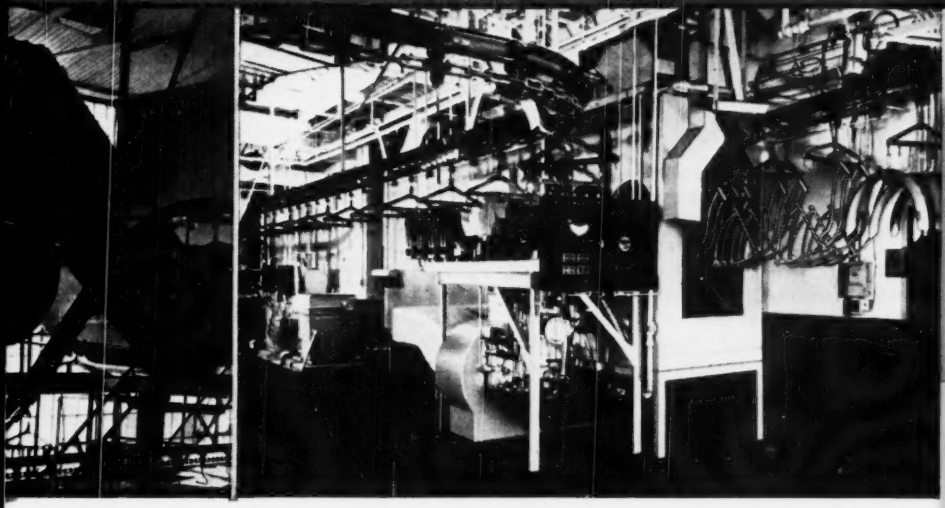

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The Complete Finishing System illustrated on these pages was planned, engineered, built and installed by Mahon for the Cleveland Welding Company, manufacturers of the famous Roadmaster Bicycle. The system was designed to produce the finest finish obtainable at lowest possible unit cost, and to occupy a minimum of floor space within the plant . . . it provides continuous conveyorized processing from metal cleaning and rust proofing through dry-off, flow coating, and finish baking operations. The flow coating machine and baking oven are located over head to conserve manufacturing floor space. This is another typical example of good planning and good engineering in modern production equipment designed to reduce costs and improve product finish. If you have a finishing problem, or are contemplating new finishing equipment, remember that the Mahon organization has pioneered development in his highly specialized field for thirty years . . broad experience in every industry where finishing constitutes a major production operation, plus constant research and experimentation, has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mech. Ind. File, or write for Catalog A-649.

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AHON

Conversion Coatings on Zinc

By VINCENT MATTACOTTI

BEFORE discussing conversion coatings on zinc, it is well to review some of the characteristics of zinc deposits. In general, zinc is exposed to two types of service conditions; namely, outdoor exposure and exposure to condensed moisture. Typical examples of outdoor exposure would be automobile nuts and bolts, or the framework of farm windmills. In outdoor exposure zinc weathers slowly, and the rate of attack will vary as does the nature of the atmosphere. In some industrial atmospheres attack will be accelerated over the rate for a rural atmosphere. Again, as well noted during the last war, the effect of tropical atmospheres far exceeds atmospheric effects commonly encountered in the Midwest. Sometimes such tropical atmospheres actually approximate the conditions existing in laboratory humidity chambers. Generally speaking, outdoor weathering of zinc produces a thin gray film of corrosion products which does not thicken owing to its solubility in the acid moisture and consequent washing away.

The second type of exposure, where condensed moisture is concerned, leads to severe corrosion and to the formation of thick white films and also to a random type of attack which leads to early red rust formation.

Since by nature zinc is one of our best anti-corrosion weapons, and since its use is increasing, it is natural that much work has and is being done to improve its effectiveness and to decrease its objectionable characteristics. The ideal zinc deposit would be one combining zinc's ability to protect against red rust with a pleasing color and a durable surface film or films to retain the color; all of this to be attained economically and consistently. While we are not yet at this stage of perfection we do have processes for zinc deposits which impart favorable characteristics enhancing the value of such deposits greatly over ordinary electro-zinc plate. To the films resulting from these processes has been given the name "conversion coatings", meaning that the surface of the zinc has been changed chemically. In appearance these films range from light iridescent colors to jet black, with no particular change in the brightness of the zinc deposit, to brilliant chrome-like films having little or no apparent iridescence. To put it another way, the first have no bright dipping action on the zinc deposits while the latter are really super bright dips which also leave a chemical film as an added function.

Conversion coatings on zinc can be obtained by electrolytic (anodic) or chemical dip processes which convert a portion of the zinc surface to the oxide or chromate or to a mixture of chromium compounds. By varying

solution composition and conditions, both the thickness of the film and its color may be varied. The difference between the electrolytic coatings and the dip-type coatings is that the former are continuous with the underlying zinc whereas dip coatings are separated by a thin alkaline film from the zinc.

Conversion coatings of the chemical or dip type are classified as follows:

1. Films produced by sodium dichromate
2. Chromic acid bright dips

Yellow, clear, or black conversion coatings of the electrolytic type may be produced.

Before discussing the methods used to produce these films, it is well to consider some of the factors leading to the choice of a film, how these films differ, and what results may be obtained under varying service conditions.

The sodium dichromate-produced film is highly colored, being a golden brown with an iridescent tone. Obviously the use of this film is limited to those applications where the use of such a color does not meet sales resistance. It would not do, for example, as the finish for a refrigerator shelf even though it does have excellent corrosion resistance, because here eye appeal is a necessity. However, it could and has been used on automobile carburetor parts where the functional requirement was of primary importance. The chromic acid type bright dips produce a film of excellent corrosion resistance and at the same time increase the luster of the zinc considerably. By the use of bleaching treatments most of the iridescence can be removed, leaving a lightly iridescent and brilliant surface which has eye appeal and corrosion resistance greater than ordinary zinc. If the slight iridescence is objectionable, it can be obliterated by applying a suitable lacquer coating. A refrigerator shelf coated in this fashion has both the

Vincent Mattacotti

VINCENT MATTACOTTI has had an excellent background to fit him for his present position of vice president of the Milwaukee Plating Company.

He is a graduate of Wesleyan University, Middletown, Connecticut, having been granted a B. A. Degree in 1932 and an M. A. Degree in 1934 with organic chemistry as his major interest. He joined the Hanson-Van Winkle-Munning Company in 1934 as a control chemist and performed research work on zinc plating, which lead to a patent on a bright zinc solution. While associated with H-VW-M, Mr. Mattacotti performed field service work and process installation, working from the Chicago H-VW-M office.

In 1942 he joined C. G. Conn Limited, Elkhart, Indiana, as chief chemist and continued in that association until 1945, at which time he became associated with the Milwaukee firm.

He is past president and a director of the Wisconsin Job Platers' Association, a vice president of the Milwaukee Branch of the American Electroplaters' Society, and served as Publicity Chairman for the 1949 A.E.S. Convention held in Milwaukee. He is a member of A.S.T.M. Sub-Committee 4 of Committee B8.

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color and the corrosion resistance characteristics desired.

The anodic process known as "Yellow Anozinc" produces an iridescent film on the zinc without any appreciable change in the luster of the deposit. By subsequent bleaching, the film is made lighter in color, producing the finish known as "Clear Anozinc." The product can be used so finished, or covered with a lacquer coating. The combination of the "Clear Anozinc" with a lacquer coating produces a finish quite similar in appearance to the zinc surface obtained by the ordinary nitric acid bright dip. However, in corrosion resistance the difference is marked.

"Black Anozinc" is produced by anodic treatment of the zinc and, as the name implies, the film is black in color. This coating, while slightly less protective than yellow or clear anodic coatings, is still far superior to untreated zinc coatings. By sealing the black coating, considerably better corrosion resistance may be had.

Hence it may be observed that the proper choice of a film depends on the requirements established by service and appearance considerations. Now let us examine the properties of these films so as to arrive at a basis for selection. It is a characteristic of the film produced by sodium dichromate that it slowly releases its hexavalent chromium to water which comes in contact with it. It is this dissolved material which inhibits the subsequent corrosion of the zinc and ensures the protection of accidently bared areas. Experiments have shown that as long as the concentration of hexavalent chromium produced by the film is 0.0001-0.0005 g./l. of water in contact with the film, no white corrosion salts should form. As an example:

Untreated	
(to white corrosion)	1 day
(to red rust)	90 days
Sodium dichromate treated	
(to white corrosion)	38 days
(to red rust)	998 days

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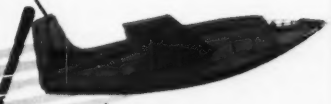
A PROTECTING BLACK FINISH

Black!



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For additional protection, after the JETAL process, apply JETOIL 1A, the all-around, oil-type after coating.

Get your iron or steel samples JETALIZED without cost . . . or ask for a JETAL demonstration in your plant.

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This indicates the tremendous increase in resistance to white corrosion brought about by the use of the sodium dichromate treatment. Besides hexavalent chromium, the film also contains insoluble trivalent chromium which is responsible mainly for the tremendous increase in resistance to red rust formation indicated by the figures above. The sodium dichromate-produced film will function best where stagnant water contact is to be expected. Exposure to normal outdoor atmosphere where parts wet with rain, mist, dew, and so on, dry relatively rapidly, poses a different problem. Here the chromate film cannot be considered as an adequate substitute for the proper thickness of zinc. In New York, for example, outdoor exposure tests showed no appreciable difference between ordinary zinc and dichromate-treated zinc. Where the hexavalent chromium content of the film is rapidly leached out, little protection against white corrosion formation can be expected.

The films produced by the various chromic acid dips (proprietary) are adherent to the zinc base and are of course chromates similar to those produced in the sodium dichromate process. One of the outstanding advantages of the chemical dips lies in their ability to produce a zinc surface possessing very high luster, which adds greatly to the sales appeal of zinc and extends the field of application for zinc plating. These films, when properly prepared, have an iridescent appearance which may be bleached out by dipping in a dilute alkali at room temperature. If complete absence of iridescence is required, the application of a suitable lacquer coating will produce a finish with a clear chrome-like appearance. Dip coatings as formed improve corrosion resistance to the point that 75-100 hours' salt spray resistance to white corrosion and from

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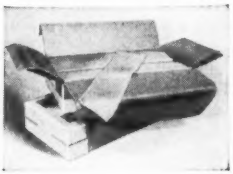

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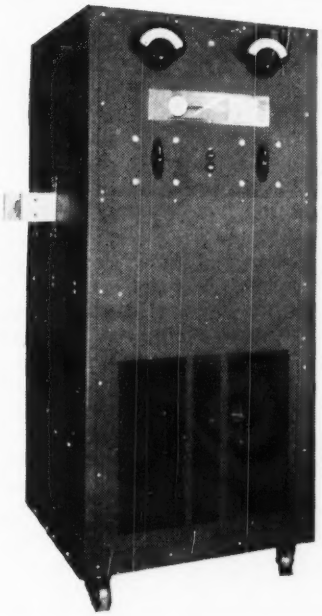

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200 hours' upward resistance to red rusting may be expected. The use of lacquer films over the clear dip films increases resistance to white corrosion (in humidity tests) to the range of from 600-1000 hours. Untreated zinc generally fails at points under 48 hours.

The films produced by the anodic process are integral with the zinc sublayer and, in the case of the yellow coating, contain some zinc oxide, zinc chromate with some soluble chromates. The appearance of the finished article is a yellow iridescent color which, by simple bleaching in a mild alkaline solution, can be converted to a clear coating. The latter coating has a silvery metallic luster, lightly iridescent. Such coatings can be lacquered or waxed to produce a finish which is free from iridescence. These anodic coatings give zinc excellent protection against white corrosion as well as red rust. For example, in a standard salt spray test, 0.00025 inch thickness of zinc will show white corrosion in 1-10 hours, whereas the yellow anodic coating will withstand salt spray for 150-200 hours and the clear coating for 130-180 hours. Both the chemical dip coatings and the clear anodic coating have found wide application in the refrigerator shelf field. Here the use of these coatings with clear lacquers over them has made it possible to produce a product having eye appeal as well as corrosion resistance. Untreated zinc electroplate is not suitable as a final finish for shelves due primarily to its lack of resistance to the formation of white corrosion products.

Black anodic coatings as well as black dip coatings and other colored zinc coatings serve in specific applications where increased corrosion resistance and a colored surface are required. The resistance of these coatings to white corrosion formation is only slightly less than that of the bright dip coatings, and so much greater than that of the untreated zinc.

The Sodium Dichromate Process

Freshly plated zinc is dipped into a solution containing 26 oz./gal. sodium dichromate and 23-34 cc./gal. of sulfuric acid for approximately 10 seconds. The work is removed and allowed to drain for not over 30 seconds and is then rinsed thoroughly in several cold rinses. The water is then removed, preferably by a cold blast of air. Zinc plate which has been allowed to dry or which is dirty should be cleaned and given a 1 per cent nitric or sulfuric acid dip prior to treating in the dichromate solution.

The concentration of dichromate is not critical and can range much lower or higher than indicated. Dragout considerations affect the choice of upper concentration, and frequency of replenishment influences the use of lower concentrations. The concentration of sulfuric acid is critical. If this

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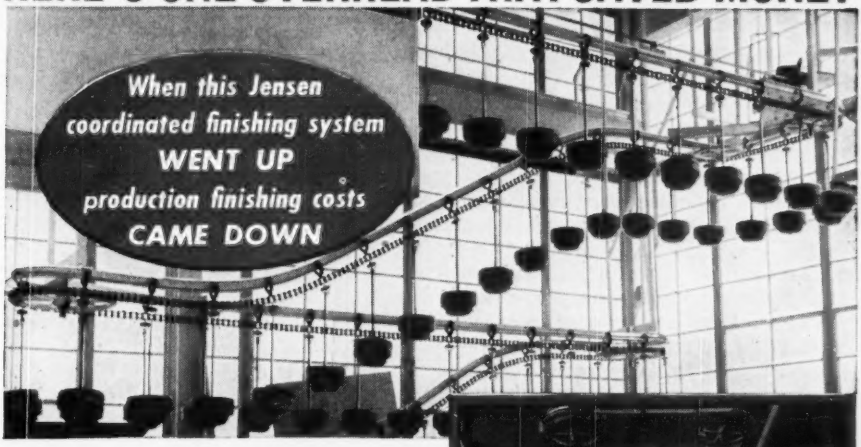

To this midwestern manufacturer, spraying and baking automotive parts on a continuous conveyor 191 ft. long, didn't seem too difficult—until it was learned that only a 70 ft. x 10 ft. floor area was available to do the job. Typical Jensen ingenuity and "know-how" gained through years of radiant heating and conveying experience answered the problem with this Coordinated Finishing System.

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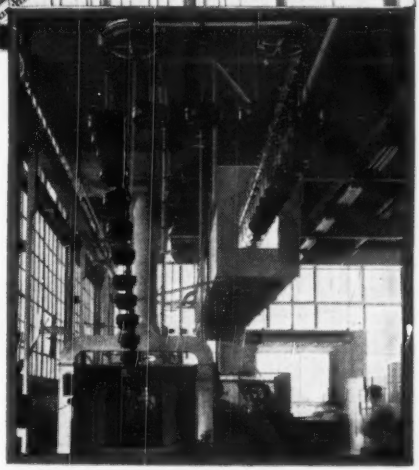

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is too low, the films form slowly and are thin and poorly protective. If the sulfuric acid is too high, the rate of zinc dissolution is too high and the film may be removed from the edges of the work.

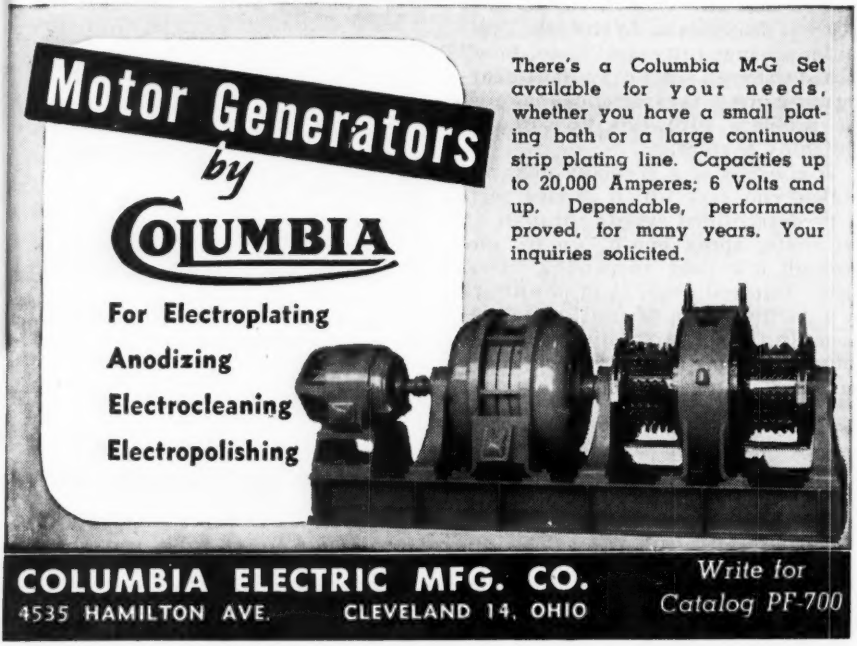
The time of immersion may vary from 5-60 seconds. Films produced during short immersion are thin and highly iridescent. As the time increases, the film becomes less iridescent and a continuous golden brown color develops. Too thick a film is objectionable because of its chalkiness. The heavier films give more protection but are less abrasion resistant and more difficult to dry. The optimum color is a golden brown with substantial iridescence.

Three possible conditions resulting in unsatisfactory films are suggested as follows:

1. Improper bath temperature. Below 60 deg. F. there is practically no film formation. Between 60 and 70 deg. F. the film formation is slow. Above 70 deg. F. the chemical reaction takes place at an increasingly rapid rate, producing chalky, poorly adherent films.

2. Insufficient sulfuric acid. Since accurate control of the sulfuric acid content is difficult, additions are made to the bath as a result of observation of the films produced. To make a sulfuric acid addition, a small sample of the bath is removed and a small quantity of sulfuric acid is added. A zinc plated article is then tested and if the film is satisfactory, the same relative addition of sulfuric acid is made to the large bath.

3. Interfering surface contaminations. If work to be treated has been allowed to remain in stock for several days, it will have acquired a surface film which will prevent the formation of a good conversion coating. Prior to processing, the work must be cleaned in a mild alkali or dipped in a weak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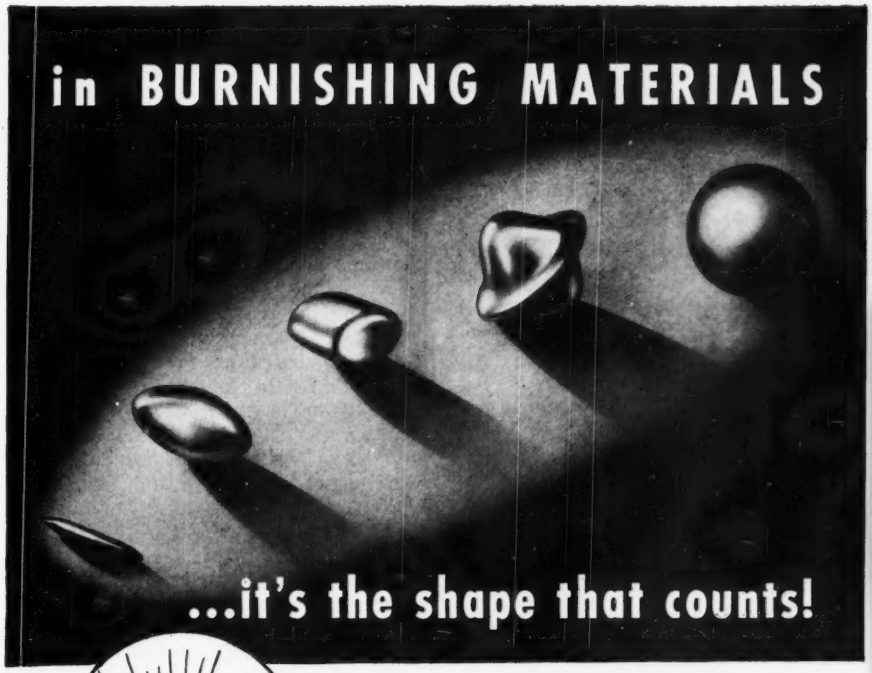

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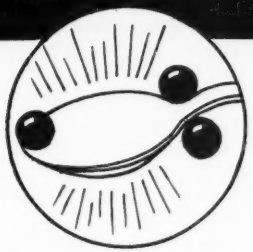

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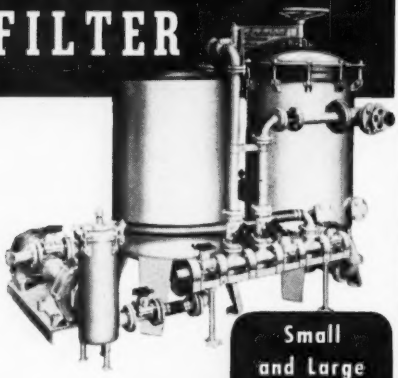
FILTER



Small and Large Capacities

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acid to activate the surface. If, while it remained in storage, the work was contaminated with grease or oil or other miscellaneous shop dirt, special cleaning operations are required prior to the conversion treatment.

After treating, the work may be allowed to drain for a period not to exceed 30 seconds to minimize dragout losses. The treating solution should not be allowed to dry on the work. The work should be rinsed, preferably in two running water rinses, so that the last rinse water draining from the work is clear and free from yellow color. This is important since the quality of the work will suffer if the treating solution is not completely removed by rinsing. Hot water rinsing should not be used to dry the surface film. Treated parts may be dried by a blast of cool air, or by whirling in a centrifuge. Work has been dried satisfactorily in a tunnel or duct through which cool air passes at 25-35 feet per second. The use of elevated temperatures, such as 350 deg. F. for drying, results in hard, adherent films which will not protect the zinc against formation of white corrosion products in contact with moisture.

The film obtained when drying by cool air blasting is fairly resistant to abrasion but improves greatly on ageing for 24-48 hours.

Nature of the Film

The film produced by the sodium dichromate treatment is the product of the reaction of zinc with the solution and appears to proceed as follows. Zinc is oxidized into solution and the hexavalent chromium adjacent to the zinc is reduced to trivalent chromium. Simultaneously the sulfuric acid attacks the zinc, raising the pH of the film next to the work. At some critical pH the trivalent chromium and some hexavalent chromium are precipitated on the surface as a basic chromate. Both sulfuric acid and the hexavalent chromium in the solution are consum-

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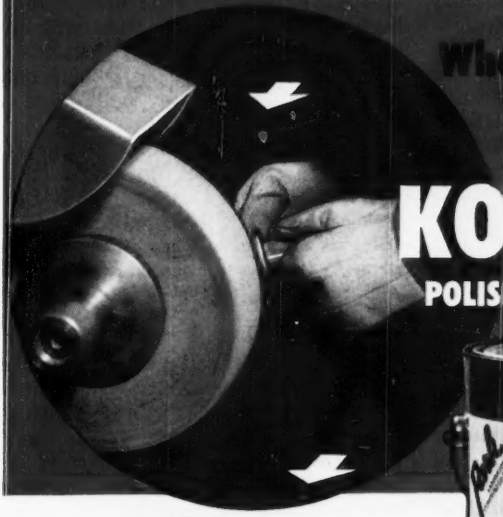

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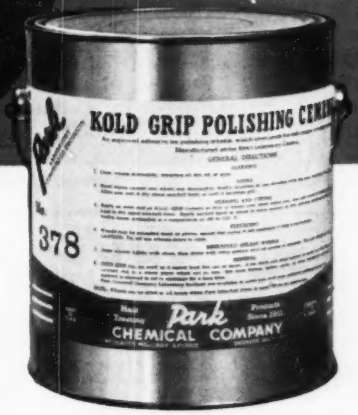

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ed. There is a considerable excess of hexavalent chromium but the sulfuric acid is present in very small amounts; therefore, additions of sulfuric acid are required to maintain the solution. As the sulfuric acid is consumed, the films become pale and lack color. The film characteristics can be maintained by frequent but small additions of sulfuric acid as determined by visual observation.

In operating the process, glass, earthenware, Koroseal-lined, or low carbon steel tanks may be used. The work should be processed with a minimum of agitation, since agitation increases the attack on the zinc and results in thinner films. Work should be racked, although small parts can be treated in bulk if care is exercised so as not to abrade the wet film. Faulty work may be stripped in a boiling solution of sulfate-free chromic acid (200 g./l.) or in hydrochloric acid.

The color of the film depends not only on time, temperature, and solution concentration but also is related to the texture and type of zinc being treated. Bright zinc will have a more highly iridescent color than will dull zinc. Zinc containing molybdenum will have a purplish hue while zinc contaminated by copper will have a strong green shade.

Some loss of zinc occurs while the film is forming, but under the most severe conditions this loss will not exceed 0.0001 inch. Generally speaking, the loss of zinc in a properly operated process will be of the order of 0.00001 inch or less.

Chemical Bright Dips

These solutions are based on chromic acid, and may contain in addition various mineral acids such as sulfuric or nitric, as well as organic acids such as formic or acetic acid. All of the commonly used solutions are proprietary and may be purchased as concentrates ready for use when diluted with water. The amount of dilution varies somewhat with each solution but in general can be said to range from 3 parts water to 1 part concentrate to as high as 10 parts water to 1 part concentrate. After dilution, the solutions are ready to operate, requiring no other additions. The optimum operating temperature is commonly between 70 and 110 deg. F. At the higher temperature brighter results are obtained at the sacrifice of some corrosion resistance. At the lower temperature less brilliance is obtained but the film has better corrosion resistance.

The procedure for producing dip coatings consists of: zinc plating in a standard bright zinc solution; thorough rinsing; dipping in dilute acid such as 1 per cent nitric or sulfuric to ensure complete removal of cyanide and other alkali films; thorough rinsing; a 5-20 second dip in the proprietary chromic acid dip. Following this dip, the work is rinsed in water and then dipped into a bleach solution,

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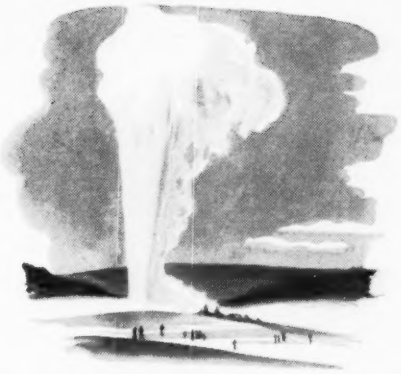

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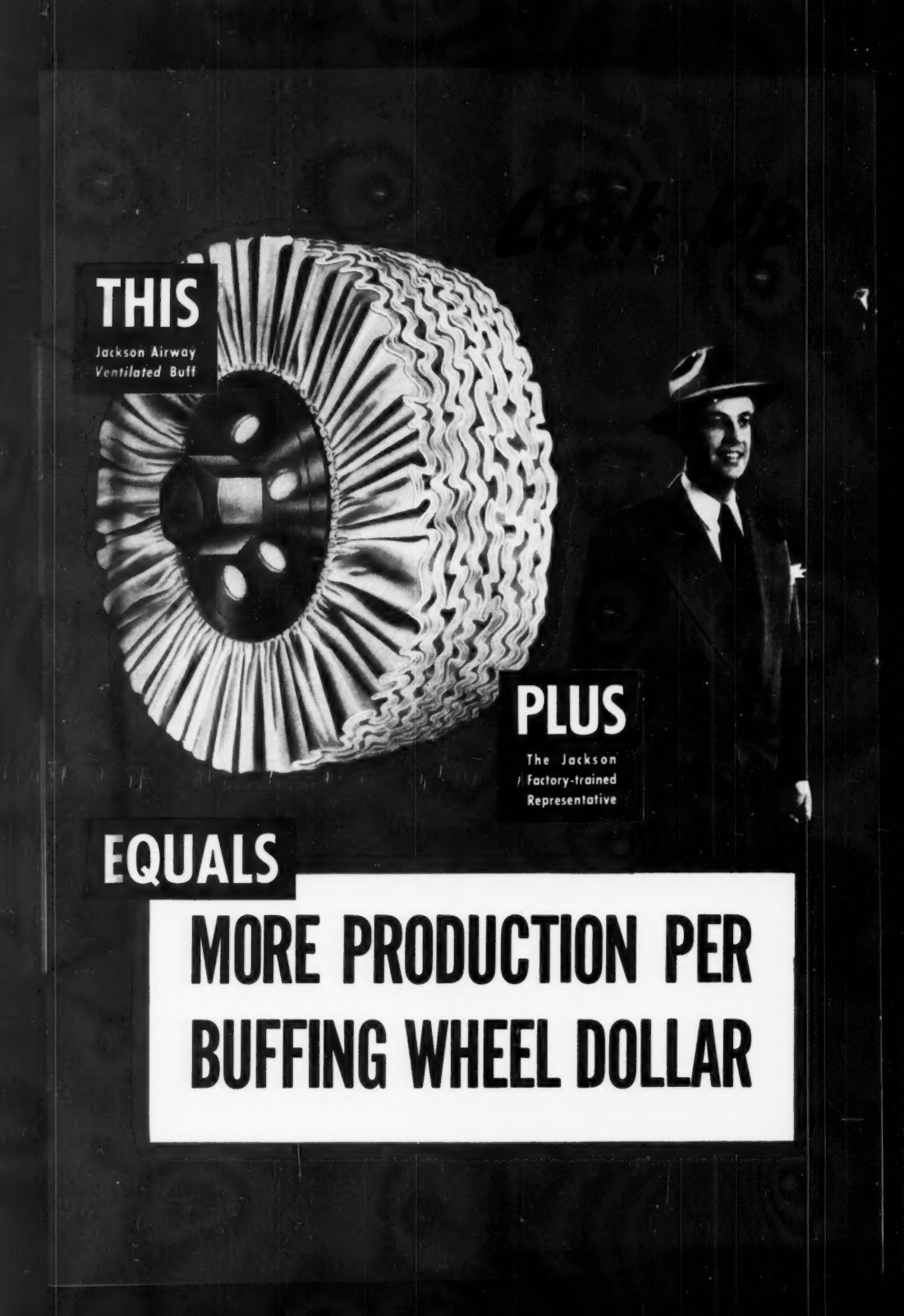
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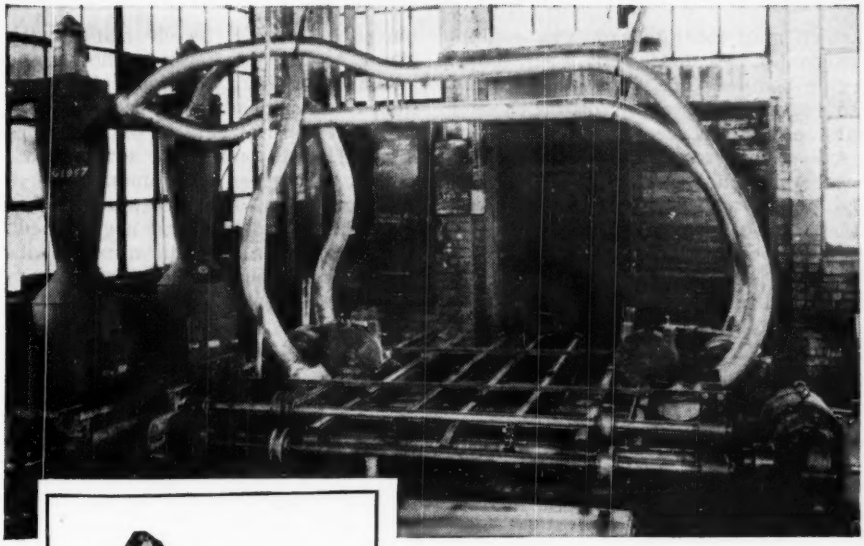

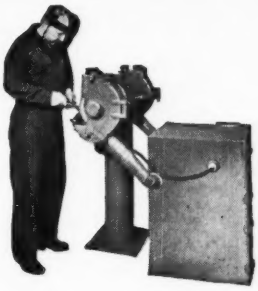

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which may contain 2 oz./gal. sodium carbonate or caustic soda, operated at room temperature. This bleach tends to reduce the amount of iridescence and produce a clear coating. A cold rinse followed by a hot rinse ends the cycle. At this point the work should be bright and clear with very little iridescence. Any iridescence remaining can be hidden if necessary by a suitable lacquer or wax.

The chromic acid bright dips may be controlled best by visual observation of the results produced and experience gained by working with them. As the dips begin to show signs of a drop in quality of the surface produced, additions of concentrate are made to restore them to optimum operating conditions. After several such additions, further additions may prove ineffective and it is then necessary to discard the solution and begin anew. It is obvious that skill must be acquired rapidly so that economy of operation and consistency of results may be obtained.

Salt spray and humidity tests made

SALT SPRAY TESTS

	Zinc Plate Thickness	*Dip Dilution*	*Bleach*	*White Corrosion Hours*	*Red Rust Hours*
1.	0.00023 inch	Nitric Acid	None	24	96
2.	"	100-1	"	96-169	
3.	"	75-1	"	168 (slight)	
4.	"	50-1	"	96 (")	
5.	"	30-1	Hypo	96-168	
6.	"	30-1	None	48-168	
7.	"	7-1	Hypo	96-168	
8.	"	7-1	Caustic Soda	48- 96	

NOTE: No. 1 is control plate.

0.0002		24	216
0.0005		24	528
0.0002	Reg. Clear Dip	72	528
0.0005	"	72	696
0.0002	30-1 dip	72 (slight)	528 (slight)
0.0005	"	72 (")	696 (") 2 pcs/4
0.0002	Sodium Dichromate Process	72 (")	528-696
0.0005	"	72 (")	528-576

HUMIDITY TESTS

Zinc Plate Thickness	*Dip Solution*	*White Corrosion*
0.0002 inch		24 hours (slight)
0.0005		24 (slight)
0.0002	Reg. Clear Dip (caustic bleach)	72
0.0005	"	72
0.0002	30-1 clear	216 (2 samples)
0.0002	Sodium Dichromate Process	216 (pinpoint break)
0.0005	"	216 (pinpoint break)

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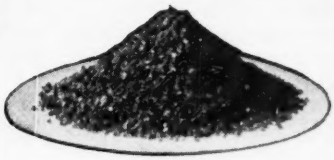
on treated zinc-plated surfaces indicate the results that may be expected from these conversion coatings. A proprietary chromic acid bright dip was used for the tests.

It is evident from the foregoing that these dips increase the corrosion resistance of the zinc surface tremendously, and consequently increase the number of applications for zinc plate. It is evident that the results are almost independent of the thickness of the zinc plate above the minimum of 0.0002 inch. Excessive bleaching, or too strong a bleach, will tend to lower appreciably the resistance of the film by removing some of the protecting materials. Where maximum luster and clarity are desired, it is recommended that a lacquer or wax coating be applied over the treated zinc.

Anodic Coatings

These coatings are formed electrolytically in proprietary solutions consisting primarily of chromates. The solution for yellow and clear coatings is the same since clear coatings are produced by hot alkaline bleaching of the yellow coatings. The solution prepared from proprietary salts should range from 17-25 deg. Baume. It should be operated around 80 deg. F. and, most important, the pH (electrometric) should be held between 5.5 and 6.0. A current density of 5-50 amp./sq. ft. and a voltage of 1.5-4 will be required. Usually 50-100 amp. min./sq. ft. will give satisfactory coatings. Processing the work for 3-5 minutes at a current density of 10-20 amp./sq. ft. will be sufficient to produce a satisfactory coating. Too heavy a coating should be avoided; too light a coating will not furnish the protection desired. The main variables to watch are the pH, which tends to rise, and the concentration, which falls due to drag-out. Too low a concentration affects the throwing power of the solution so that a good coating is not produced in recesses or shaded areas. Operating outside of the pH range is undesirable



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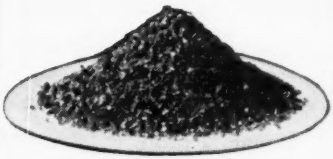

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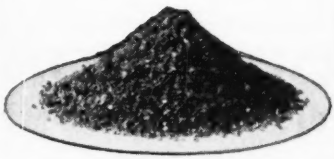

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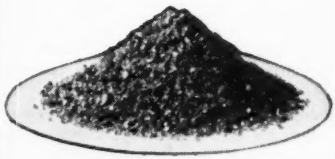

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since inconsistent results are obtained, in addition to colored, blotchy, and bare areas on the work. The process is easy to operate and with attention to a few details, consistent and economical performance can be obtained. Noteworthy are the following test results showing the resistance of these films.

lar conditions failure of untreated, lacquered zinc occurred in 50-75 hours.

The yellow anodic coating produced by the above process is rinsed and then bleached in a sodium carbonate solution operated boiling to form a clear coating. The bleaching time can range up to 15 minutes and is followed by a cold rinse and a hot rinse.

SALT SPRAY TESTS

Zinc Thickness	*Anodic Coating*	*1st White Corrosion Hours*	*Red Rust Hours*
0.0002 inch		1-2	200
0.0002 inch	Yellow	150-200	650
0.0002 inch	Clear	130-180	650

In humidity tests refrigerator shelves coated with 0.0005 inch of zinc and subsequently coated with a lacquer over the clear anodic film have been tested for 1000 hours without showing signs of white corrosion. Under simi-

A black anodic coating is produced in a solution similar to that used for the yellow coating, operated at a pH of 2.5 to 4.5 electrometric. The concentration should range between 18-22 deg. Baume and the solution should be

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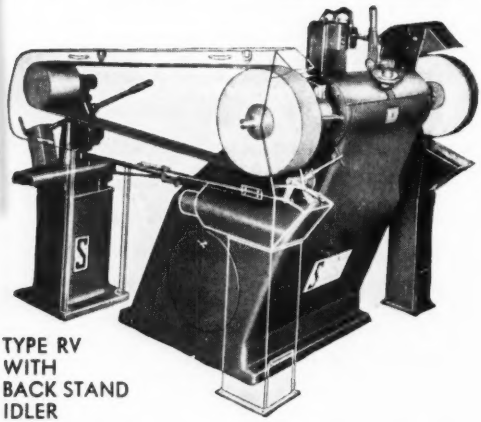

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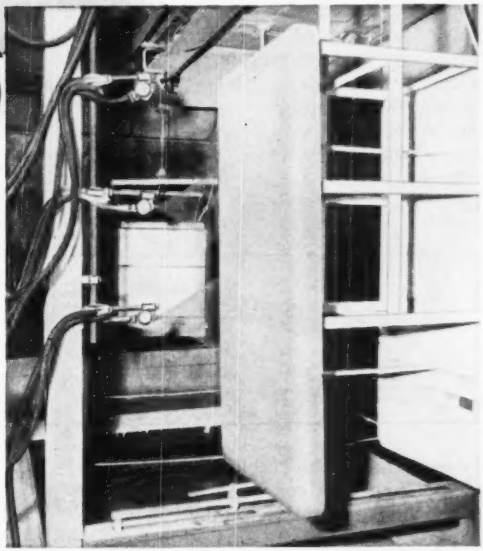

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used at room temperature at a voltage of 1.5-4, and a current density of 5-50 amp./sq. ft. for 2-10 minutes. After zinc plating the work is rinsed in cold water, then in warm water, and is then made the anode in the black anodic processing solution for the proper period of time. After treating, the work is rinsed in cold water, hot water, and then dried. For maximum salt spray and corrosion resistance it is desirable to seal the coating by immersion for 5-15 minutes at 180-212 deg. F. in a solution containing 2 oz./gal. of Black Anozinc Compound 42.

Typical test results obtained with these black coatings are as follows:

SALT SPRAY TESTS

Zinc Thickness	*Anodic Coating*	*1st White Corrosion Hours*	*Red Rust Hours*
0.0002 inch	Black Unsealed	75-125	650
0.0002 inch	Black Sealed	100-150	1000

By increasing the thickness of zinc to 0.0005 inch, the red rust figures may be raised to almost double the value shown, but the white corrosion figures remain unchanged.

There are many other types of solutions which produce conversion coatings having desirable properties. The foregoing illustrates the growing importance of such coatings and furnishes adequate evidence of what can be done to ordinary zinc deposits to enhance their value. Today, knowing the conditions to be met, one can choose the proper conversion coating for zinc which will give the performance required.

Conclusions

The conclusions to be made on conversion coatings can be briefly summarized.

1. Conversion coatings retard formation of white rust on zinc. The improvement may be of the order of 10-30 times more resistance than is offered by untreated zinc.

2. Conversion coatings greatly increase the protection against red rust furnished by zinc over steel.

3. Conversion coatings provide the greatest relative increase in corrosion resistance on zinc which is 0.0002-0.0003 inch thick.

4. Zinc deposited from pure solutions forms a conversion coating of greater resistance than zinc plated from a contaminated solution.

5. The smoother the base metal, the better the corrosion resistance of the zinc plus the conversion coating.

Personal experience in the field would indicate one further development needed to provide the ideal zinc finish. This would be a zinc plating solution which would produce a mirror bright zinc without the use of metallic brighteners. This brilliant deposit would then be anodically treated and bleached to a clear color and subsequently a clear lacquer applied over this to make the finish durable. Such a finish would be brilliant, almost as attractive as chromium, and possessing corrosion resisting properties of a high order.

Adapted for PRODUCTS FINISHING from a talk presented at a meeting of the Rockford Branch, American Electroplaters' Society.

NOTE: The author acknowledges with thanks the assistance of Leonard Weeg, National Lock Company, in supplying the salt spray data used in this article.

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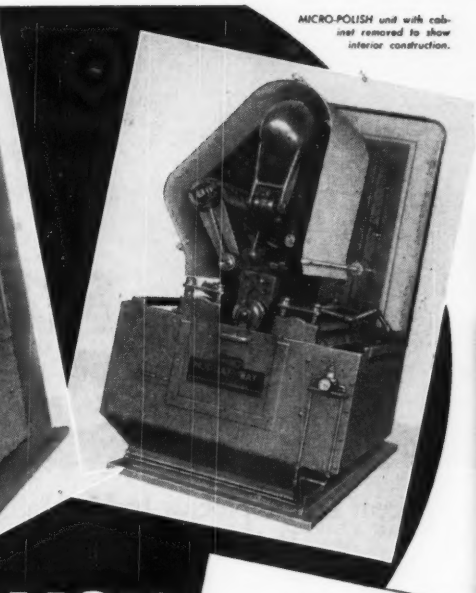

MICRO-POLISH unit with cabinet removed to show interior construction.

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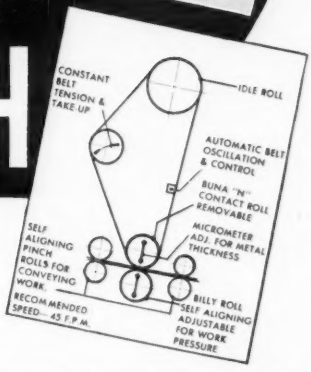
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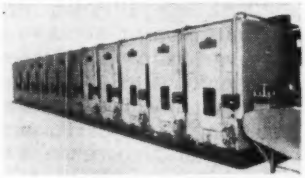

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AUTOMATIC POLISHING, BUFFING, GRINDING EQUIPMENT

Spotlighting FINISHING Progress

Recent Developments In Metal Polishing

By DR. ALLEN G. GRAY

METAL POLISHING is an important part of metal finishing operations and usually pays big dividends in added sales value of manufactured products; yet the art of polishing is relatively complicated, largely understandardized, and in many cases more costly than necessary. Some of the more recent advances in methods of metal polishing, as applied in product finishing operations, were discussed and demonstrated before the Buffalo Branch, American Electroplaters' Society, at a recent meeting, held at the plant of the Carborundum Company, Niagara Falls, N. Y. J. B. Aust of the Coated Products Division of Carborundum headed the group of abrasive specialists who discussed various aspects of new abrasive belt polishing methods as applied to specific metal products and finishing problems. Previous to this gathering at the Carborundum plant, Wm. A. Corse, also of Carborundum, discussed finishing and polishing methods prior to plating before the Detroit A. E. S. Branch.

In the metal product finishing field the term "polishing" is a rather loosely-used term which may mean the removal of tool and die marks, parting lines, pits, deep scratches, and other surface imperfections, to form a smooth, uniform finish. For many years, this work has been done by means of resilient polishing wheels made of a variety of cloth materials, felt, and

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The initial cost of Platecoil is often 50% or more below the cost of equivalent pipe coil depending, of course, on the materials used in construction.

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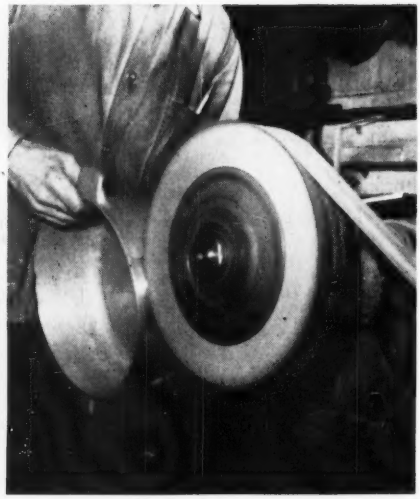

Fig. 1—Polishing aluminum pots using a grit 80, 2 x 132-inch Lightning Metalite Cloth Belt (*Photo courtesy Behr-Manning, Troy, N. Y.*)

and other bases. The polishing edge or face so formed is coated with an abrasive. The grit size of the abrasive may vary from coarse to fine, depending on the condition of the metal surface and the amount of stock to be removed. As can be expected of operations in which the human factor plays such an important part, polishing and buffing have long been looked upon as arts. It is encouraging to note that some of the problems in this field are now being approached in a more scientific manner.

Belt-Backstand Method

The use of factory prepared endless coated abrasive belts is fast becoming popular on many polishing operations previously calling for set-up polishing wheels. It was pointed out at the Carborundum meeting that in many instances it has been found that production can be increased with an attractive savings in time, labor, and material. For roughing out polishing operations, fine grit sizes are used, and in some cases a low melting point grease stick is applied to the belt to prevent loading or glazing of the belt and overheating of the work. It has been found that the addition of such a lubricant generally produces a smoother, brighter surface. Figures 1 to 8 show typical backstand polishers for use on metal products.

In general, the belt-backstand equipment consists of a contact wheel mounted on a polishing lathe in the place of a set-up wheel. The coated abrasive belt is tracked over a contact wheel by means of the backstand idler mounted behind the machine. The

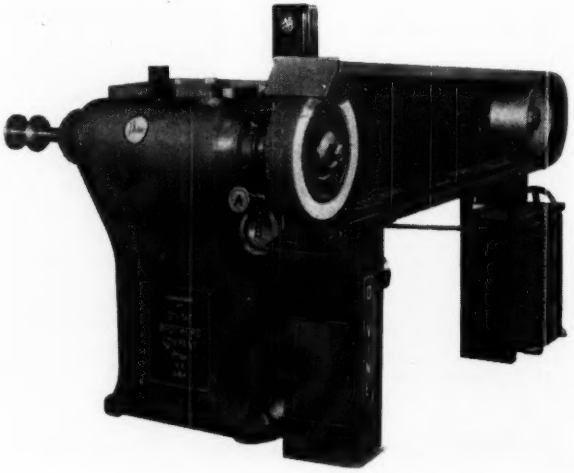

Fig. 2—Factory coated abrasive belts are finding use in metal polishing applications. Shown here is a typical belt backstand polisher. (*Photo courtesy The Carborundum Co., Niagara Falls, N. Y.*)

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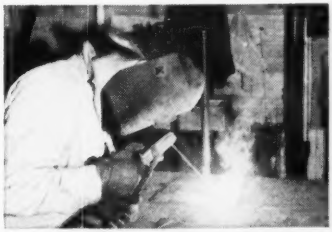

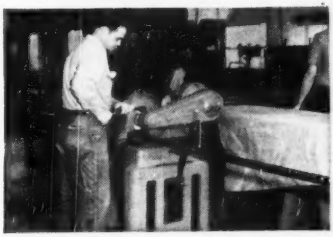

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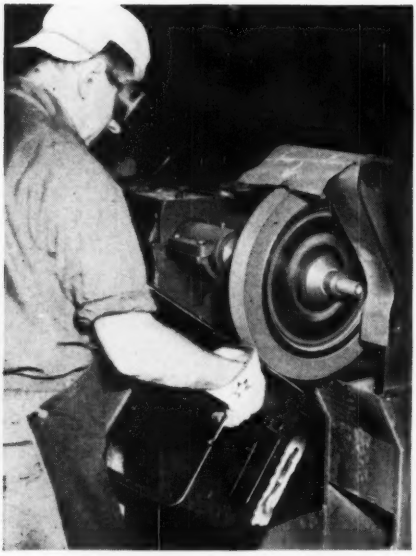

Fig. 3—Illustration shows a coated abrasive belt being used to polish sheet steel assembly (*Photo courtesy Armour & Co., Coated Abrasives Division, Alliance, Ohio*)

work is done on the belt, supported and driven by the contact wheel in the same position as with set-up wheels. Also, there is a small area or line contact such as is present with grinding wheels or set-up wheels. The contact wheel design affects both the cutting action and life of the belt. The backstand idler provides a means whereby more abrasive area is put to work with existing equipment. For example, it was brought out that a standard length (14 feet x 4 inches) backstand belt has four times the abrasive area of the usual set-up wheel (14 x 4 inches). The belt-backstand method is used for grinding, rough polishing, fine polishing, and "oiling out" in preparation for plating. This method was developed during the war and has found wide acceptance in the postwar era.

It was brought out by the Carborundum group that the most important advantage to be derived from the belt-backstand method is the extremely fast rate of cut which is due primarily to the inherently sharper coating of the coated abrasive belt as compared to either grinding wheels or set-up wheels. The fast time results in less time per piece to be polished; thus, less labor cost per piece per operation and higher production per day per man. A second advantage of this method is that it is frequently possible to reduce the number of operations necessary to produce a certain finish. This is done by skipping one or more grit sizes and so taking larger steps between operations.

Non-ferrous metals, such as die castings, may frequently go directly to the finishing operation after deburr-

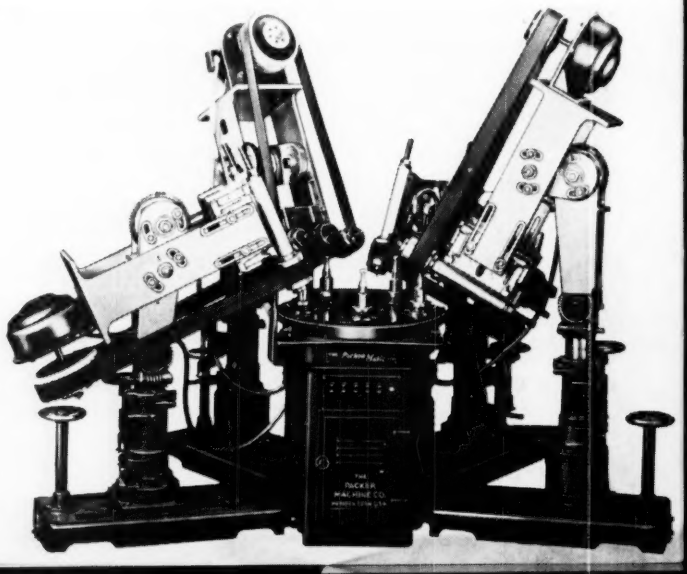

Fig. 4 — Illustration shows an automatic indexing rotary polishing machine, equipped with universal abrasive belt heads which can be adjusted for polishing all surfaces of round or curved objects. (*Photo courtesy The Packer Machine Co., Meriden, Conn.*)

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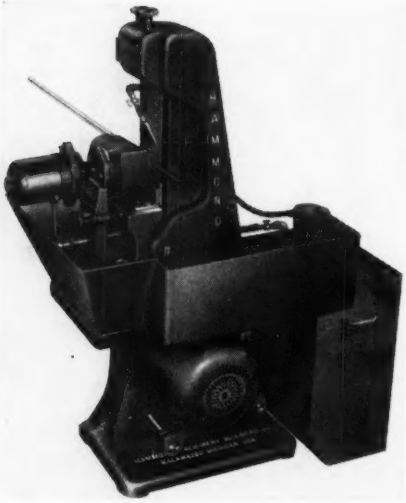


Fig. 5—Centerless grinding and polishing machine used with 4-inch wide, 60-inch long coated abrasive belt to polish rods, bars, tubes, and so on

(Photo courtesy Hammond Machinery Builders, Inc., Kalamazoo, Mich.)

ing. An illustration, cited from Carborundum field experience, was that of a concern that manufactures silver plated gravy bowls. These are deep drawn from nickel-silver and were formerly polished with a 190 grit set-up wheel, followed by a 220 greased set-up wheel. It was pointed out that by changing to the belt-backstand method it was possible to cut out the 180 grit operation and produce the finish required for plating with a 220 grit greased belt. However, it was emphasized that steel is different in that it is almost always necessary to rough polish. This is especially true for forgings that are received in the polishing room as trimmed rough forgings with most of the flash trimmed off. An example cited was the polishing of forged steel bicycle cranks, wherein it was found that a satisfactory procedure consisted of rough polishing on a backstand with 60-grit belts, going directly to final polish with 180 grit. At least one intermediate operation would be needed it set-up wheels were used.

Another benefit cited for the backstand method was that of obtaining a better finish. This was attributed largely to the superior factory coating on backstand belts as compared to hand-coated set-up wheels. It was also brought out that another factor in obtaining a better finish is in being able to select the right contact wheel for

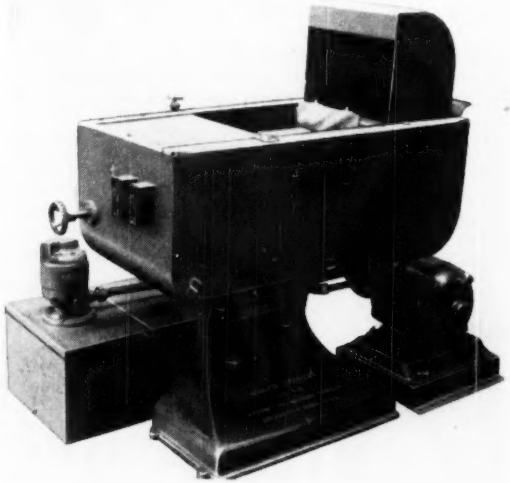
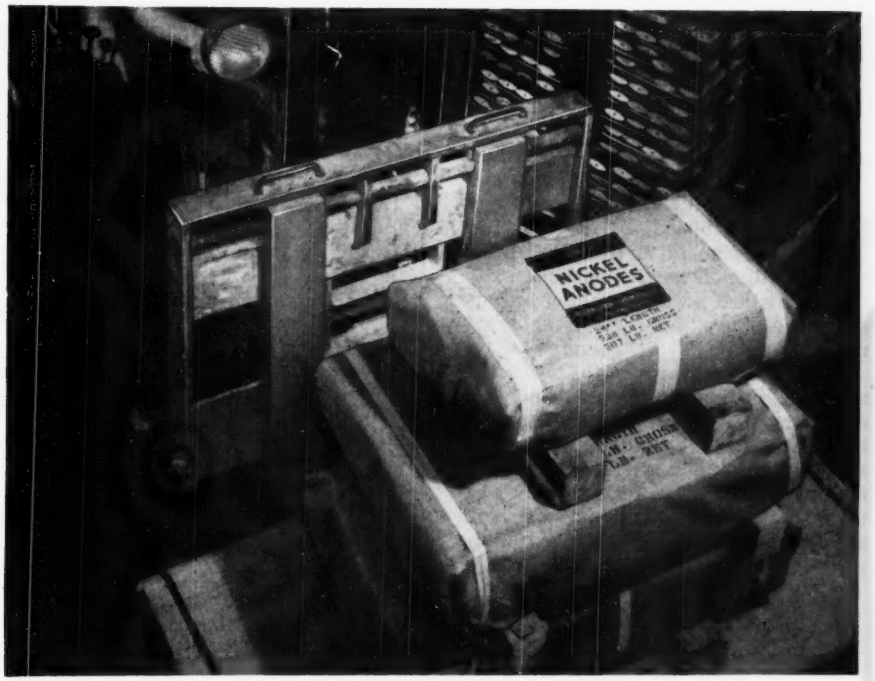


Fig. 6—This horizontal wet or dry belt surfacing machine for flat polishing of die castings, cast iron, steel, alloys, and other materials provides rapid, accurate surfacing with a minimum of effort on the part of the operator.

(Photo courtesy Production Machine Co., Greenfield, Mass.)



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each job. These can be generally classified as hard, medium or soft wheels. The hard wheels are used for rough polishing where stock removal is more important than finish. The medium and soft are used for fine polishing or "oiling out" on relatively flat surfaces. Also, a pleated-buff type of contact wheel is used for fine polishing on contoured surfaces that the harder wheels will not handle satisfactorily. Contact wheel action, cushion and effectiveness are generally stable and unchanging.

A fourth benefit given for belt backstand polishing methods is that less experienced personnel are required. Reasons cited to substantiate the shorter training period for operators as compared with set-up wheels is that the contact wheel maintains its shape, diameter and action. Also, the coating of the belts and their rate of cut are more constant than may be expected with set-up wheels. An example cited was that a part, which was rough polished in 25 seconds with a new belt, required 5 seconds longer when the belt was ready to be changed; in another instance, that of deburring die castings, the work was done in 6 seconds with a new belt and 7 seconds when the belt was worn out. It was predicted that the metal product finishing industry can look for further developments in the field of backstand polishing—improvements in belts, contact wheels, and so on, and also new applications of the method.

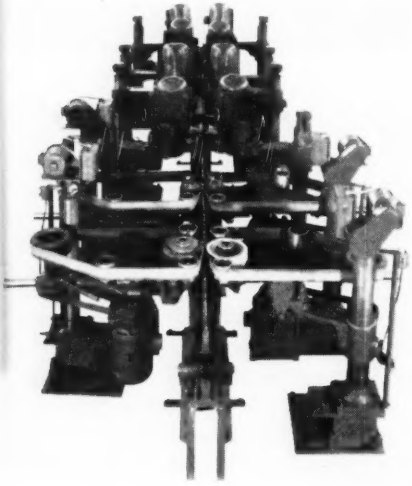

Fig. 7—A view of a straight-line polishing and buffing machine utilizing 4 oscillating polishing belt heads and 8 buffing heads, used for polishing and buffing Ronson cigarette lighters

(Photo courtesy Acme Mfg. Co., Detroit 16, Mich.)

Fig. 8—Use of a grooved buff contact wheel in conjunction with a 3-M-ite abrasive belt accomplishes polishing of contours on bicycle crank forgings.

(Photo courtesy Minnesota Mining & Mfg. Co., St. Paul 6, Minn.)

Brush-Backed Sander Head Method

Some of the typical applications of the brush-backed sander head were demonstrated in the Carborundum Company's experimental polishing room. It was pointed out that because

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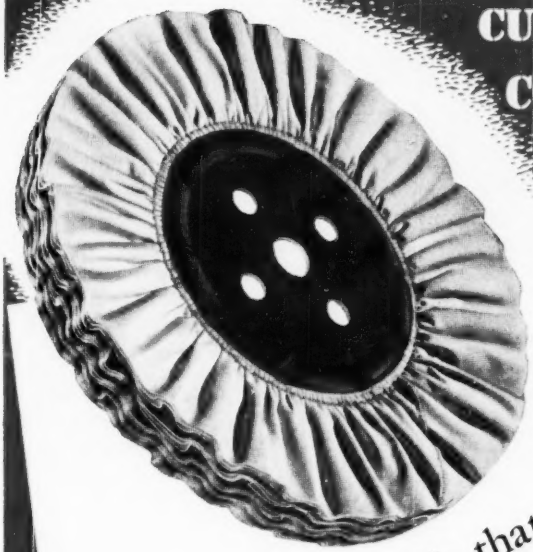

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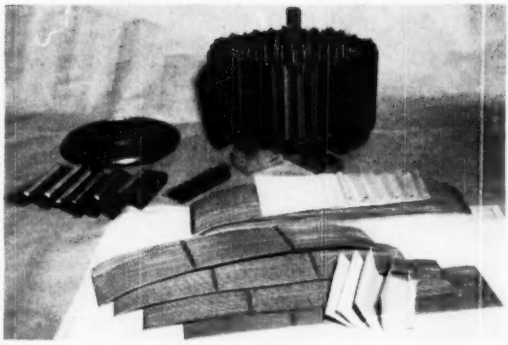

Fig. 10—The Vonnegut sander head before assembly
(Photo courtesy The Carborundum Co., Niagara Falls, N. Y.)

of its unusual adaptability to many kinds of work, this method is solving new finishing problems. Being so flexible in action, it is particularly effective on contoured pieces and may be used either on ferrous or non-ferrous metals. It was pointed out that its principal field is in competition with charged buffs. It is a pre-buffing or blending tool and is not considered suitable for stock removal. The finish produced is a satin-finish type of pattern as compared to the straight line scratch pattern of a polishing belt. While the brush-backed sander head principle has been used successfully for years in woodworking shops throughout the country, its introduction to the metal polishing field is definitely new; it has already proved both practical and economical in many applications. Figure 9 shows this method being used for polishing a typical metal part.

Fig. 9 — The Vonnegut brush-backed sander head as used in polishing a typical metal part. This method, which uses coated abrasive strips, is said to conform to irregular contours and produce a uniform finish.
(Photo courtesy The Carborundum Co., Niagara Falls, N. Y.)

The advantage in using the brush-backed sander method is that a substantial saving is realized. It was brought out that this is due chiefly to the fact that the cutting abrasive particles are held in place on the cloth backing and made to work. With charged buffs, much of the abrasive is thrown off and is not made to do any work. The method has the ability to adapt itself to the contour or irregular surface of the work, by means of its shredded abrasive tips, which are pressed into every groove and depression. It follows the contour of the surface with ease and produces a finer and more uniform finish than can be obtained by many other methods. The method is adaptable to automatic or semi-automatic operation as well as to hand application.

The brush-backed sander head is essentially simple in design and construction, consisting of the following primary parts: the outer frame for holding replaceable brushes, and the inner spool for attaching coated abrasive strips. An assembly consists of four strips of abrasive coated cloth

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Fig. 11—Insertion of loadings in sander head. The 32 abrasive strips are passed between the brushes of the outer shells.
(Photo courtesy The Carborundum Co., Niagara Falls, N. Y.)

with anchoring loops attached. Eight of these assemblies are used to complete one loading of the sander head. Figure 10 shows the sander head before assembly; the insertion of loadings is illustrated in Fig. 11. The 32 abrasive strips employed are passed between the brushes of the outer shell. The inner frame or "spider" is rotated so that the strips are brought into working position. The exact extension beyond the brush tips depends upon the work to be done.

The head is adaptable to various contours, either on different pieces or on different areas of the same piece. Abrasive loadings for the head are available in two general types; namely, aluminum oxide and silicon carbide. Aluminum oxide is available in from 50 to 400 grit; silicon carbide from 50 to 600 grit. Then by using any of these dry or with a grease stick, an even greater variety of finishes may be obtained. One example, cited from Carborundum field experience, was that of polishing alloy steel turbine blades. In this case it was possible to produce a 3½ micro-inch finish by using 600 grit silicon carbide loadings.

To adjust loadings in the head for operation, the head is mounted on the spindle and the nut tightened to secure the head, as is shown in Fig. 12. The machine is started and the face of the revolving head raked with scrap material. Centrifugal force, plus the raking action, will remove all internal slack in the loading. Normally this will bring the tips of the abrasive strips approximately ½ inch beyond the brush tips, which is the average working length.

The brush-backed sander head is mounted on lathe spindles and the work is presented to it manually or mechanically. It can be used on swing-frame grinders, straight line polishing machines, and in conjunction with rotary automatics. In operation of the polishing method the work is pressed gently into the face of the head for best results. Greater pressure will neither improve the finish nor speed the finishing process, it was pointed out. Excessive pressures needlessly wear out loadings and brushes, and may even weaken brush holders. It is good practice to protect sharp edges or corners that must be maintained by masking them with tape, metal collars, or plugs. The proper backing and abrasive should be selected for loadings to meet require-

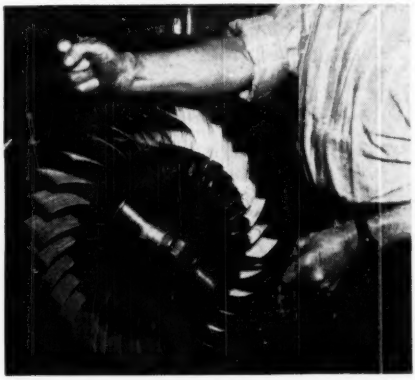

Fig. 12—Adjusting loadings on the Vonnegut brush-backed sander head
(Photo courtesy The Carborundum Co., Niagara Falls, N. Y.)

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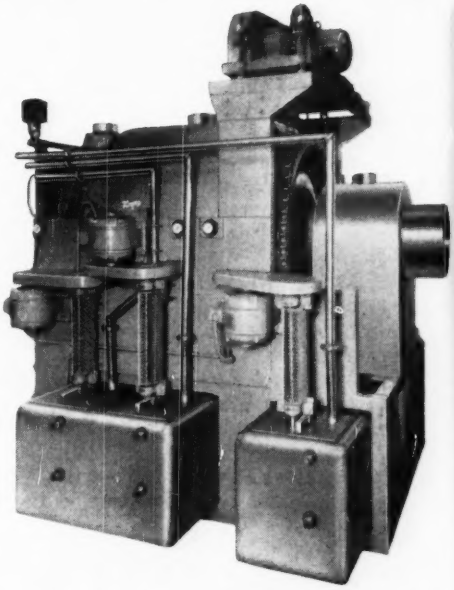

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ments of materials being finished. One important fact to remember is that these heads are designed primarily for a finishing operation; thus, any great amount of stock removal should not be attempted.

A summary of the outstanding properties of the brush-backed sander head method is as follows.

1. Unusual ability to follow contours, curves, carved and molded surfaces.
2. Cushioned wiping action that imparts an excellent finish for anodizing, buffing, or plating.
3. Effectiveness in blending surface irregularities and eliminating scratches, and wheel and belt marks.
4. Cool cutting which eliminates work discoloration and improves work conditions for the operator.
5. Minimum loading of abrasive material.

The brush-backed sander head generates a satin finish, which can be readily buffed out on flat or contoured metal surfaces. Furthermore, it has been used to prepare metal surfaces for painting and to eliminate hand sanding of undercoat prior to the final spray coat. It was also pointed out that the heads can be used to clean out shallow pits in rolled soft metals, such as copper, and for the removal of light scale from heat treated metal parts. In some instances it has been found that this scale-removing operation minimizes or completely eliminates the need for pickling.

Mechanical Flat Polishing Prior to Forming

Some of the advantages to be gained from mechanical flat polishing with belts prior to forming are: (1) high production; (2) reduction in amount of hand labor involved; and (3) a more uniform finish produced from piece to piece and from day to day, because it is a mechanized operation employing factory-coated abrasive belts. The procedure currently used is a continuous one. The flat stock up to 60 inches wide is put through a series of flat belt polishing machines called "heads" by the trade. The first few of these are roughing heads and use 60, 80 or 100 aluminum oxide belts, depending on the surface condition of the stock. These are followed by a series of intermediate heads employing successively finer grit sizes and leading up to the finishing machines, which produce the final finish suitable for plating. These employ 220 or 240 aluminum oxide greased belts and will give a finish of 25 micro-inches or less. One point to be kept in mind is that considerable investment in capital equipment is necessary for full utilization of this

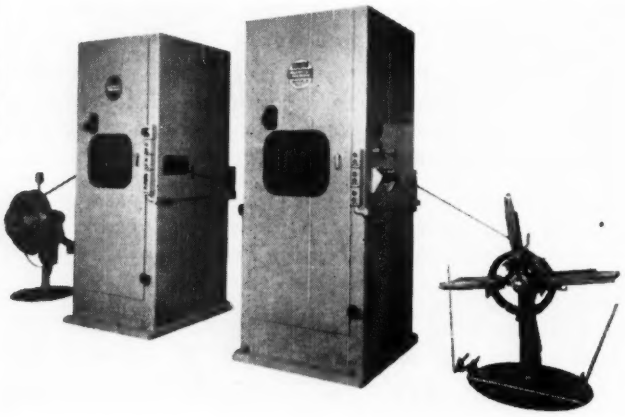
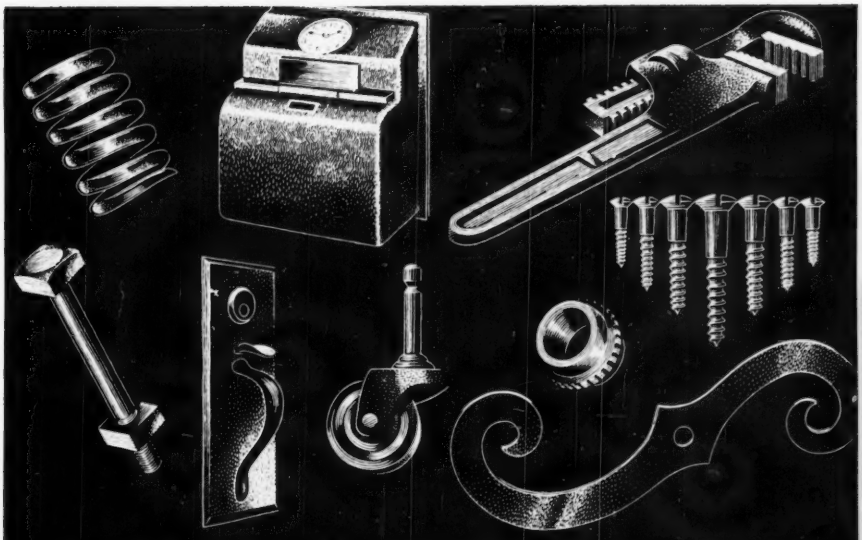


Fig. 13—One type of commercially used strip grinder and polisher
(Photo courtesy Curtis Machine Corp., Jamestown, N. Y.)



Durable, matte black finish on iron and steel resists rust.... Parco Compound

This is the famous Parker rust inhibitor, constantly improved during the 30 years it has set standards for protection of iron and steel.

Parco compound adds greatly to the appearance of the treated parts. Combined with stains or oils, an attractive matte black finish is produced.

This treatment, still at its pre-war low cost, is more efficient than ever.

Processing time has been cut, operation is simplicity itself, and results are uniformly excellent. The only limitation on size of parts treated is the size of the processing tank. Parco Compound can be used on complicated shapes, and on parts with close tolerances, too, since there is no appreciable change in dimensions.

Parco Compound may well be the answer to protect your iron and steel production from rust and corrosion. A request will bring full information. Write today.

PROTECTED BY Parco Compound QUALITY RUST RESISTANT

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PARKER

PARKER RUST PROOF COMPANY
2172 East Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

polishing method. Shown in Figs. 13 and 14 are two varieties of the strip grinder and polisher.

The polished stock is inspected while on the conveyor which takes it

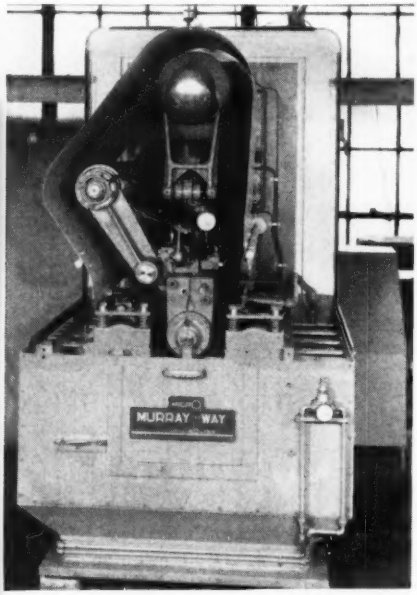


Fig. 14—A view of a Micro-Polish sheet grinding and polishing machine with the enclosing cabinet removed. Using abrasive belts, either wet or dry, the machine can polish sheet, strip, or blanked parts.

(Photo courtesy The Murray-Way Corp., Detroit 16, Mich.)

to the degreasing machine. After the grease from the polishing heads has been removed, the polished sheets are coated with a strippable plastic, resinous, or a "dry draw coat" that protects the polished surface during the subsequent drawing or forming operation. These coatings may be applied either by spraying, dipping, or rolling. The next operation is the forming of the part. After forming, the plastic or resinous coating is peeled off and the parts are then ready for the plating operation.

Polishing Flat Metal Blanks With Conveyor Feed

In discussing further applications of belt polishing methods, it was brought out that machines are available for polishing flat metal blanks using a conveyor belt feed. In this application, flat hardware, knife blades and similar small parts may be fed manually by conveyor belt or other means. Such machines can be adapted to produce any desired finish from a rough grind to a high polish.

To give long and durable service, both outer and inner surfaces of air-conditioning units must be carefully finished so they are protected against corrosion. Air-conditioning equipment is used all over the world in all sorts of climates so that the metal must be protected against sun, rain, snow, dust, fumes and salt air. Then there is operational corrosive action. Evaporative condensers and coolers are subjected to the corrosive combination of water, dust and fume-laden air. There is also an encrustation of lime which accumulates due to the use of hard water. This must be removed two or three times a year with hydrochloric acid.

"White Magic," a 30-minute, 16 mm. sound movie in color, showing the latest techniques in the production, use, and spray application of "Dulux" white enamel for home appliances, has been released by the Finishes Division, E. I. du Pont de Nemours & Co., Wilmington 98, Del. The film was made on the production lines of nationally-known manufacturers, as well as Du Pont plants in Toledo, Ohio, and Chicago, Illinois.

In addition to telling the story of how finishes are made and applied, the film indicates how savings may be effected and the finish improved by using proper spraying technique. Hints of value to manufacturers and their paint crews are also included.

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NEWS of the Industry

NEW PLANTS

COWLES CHEMICAL CO., Cleveland, Ohio, has moved its research and development laboratory from the campus of Syracuse University to enlarged quarters at 105 South Townsend Street in downtown Syracuse, New York, according to an announcement by Dr. C. W. MacMullen, technical director.

The new laboratory is of fireproof construction, having a reinforced concrete floor, brick walls, and sheetrock ceiling. Research projects include development of heavy chemicals in the silicate field, laundry products, metal cleaners, detergents and bactericides for the food processing industries, organic research, and the engineering of new processes and equipment for the company's three plants located at Lockport and Skaneateles Falls, New York, and at Sewaren, New Jersey. These projects are conducted by a staff of twenty chemists and engineers under the direction of Dr. MacMullen.

The **Roto-Finish Company** has transferred its operations from Sturgis, Michigan, to its new factory at Kalamazoo, Michigan.

One of the many outstanding features of the Roto-Finish plant is the sample processing department which is located in a specially designed area 25 feet wide by 80 feet long. The floor is built for proper drainage and all material handling is

A view of the new research and development laboratory of the Cowles Chemical Company

New plant of Roto-Finish Company

accomplished by an overhanging bridge crane system which services the complete installation.

All models of Roto-Finish equipment and supplies are used in this department in order to demonstrate Roto-Finish Processes under ideal conditions, and to duplicate actual plant production operations, Prospective Roto-Finish users' parts are finished in this department.

The sample processing department also has several new experimental machines which are constantly being used in the development of improved finishing methods.

Adjacent to the sample processing department is an ultra modern experimental laboratory used for Roto-Finish development work. In addition to these facilities, an engineering department is maintained for the development of new Roto-Finish equipment for customer service.

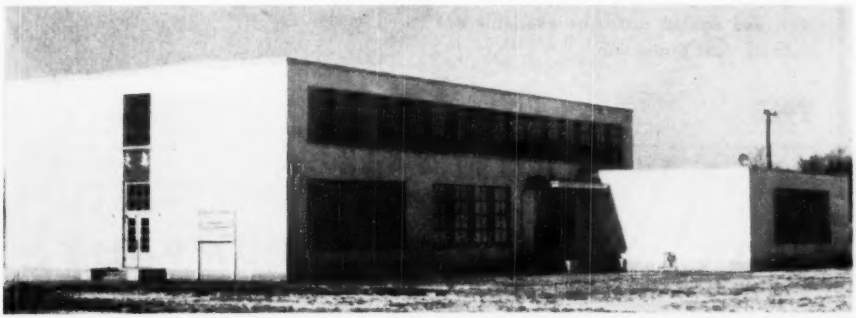
The remainder of the plant is divided into executive offices, administrative offices, accounting, and so on. Ample space has been allowed for manufacturing areas and loading docks.

The **MacBETH CORPORATION**, manufacturer of scientific equipment, has announced the removal of all its manufacturing activities, together with its executive and general offices, to a new plant located at Newburgh, N. Y., about 60 miles north of New York City.

Plans for the construction of a $3,000,000 office building by the **MINNESOTA MINING & MANUFACTURING CO.**, St. Paul, Minn., have been announced by R. P. Carlton, president.

The new unit will relieve congestion in the present main office building, permit consolidation of other scattered office groups and allow for future expansion. The new structure will be adjacent to the present three-level administration building.

Another part of the firm's nationwide expansion program is a two-story, block-long manufacturing plant now under construction in St. Paul. It is scheduled for completion next fall and will cost more than $2,000,000.



New plant of the MacBeth Corporation

"Our administration building was completed in 1940, but we have long since outgrown it," Carlton declared. "Of the 4,800 employes we have in St. Paul, nearly 1,000 work in offices and they all need more room."

C. P. Pesek, the company's vice president in charge of engineering, stated that, although the building was designed for seven floors and a full basement, only five floors and basement will be built for the present.

East and west walls will be windowless to prevent entrance of glare and heat from the summer sun. Sun shades will project over windows on the south wall as further protection.

The structure will be of reinforced concrete and masonry with a brick and stone exterior, will be fully air conditioned and equipped with fluorescent lights throughout. A cafeteria is included in the plans.

It will be connected on the first three levels with the administration building. One freight and two passenger elevators will be installed, with provisions for a third passenger lift in the future.

Each floor will contain 34,320 square feet of space, with five floors providing working space for more than 1,200 employes.

R. D. TRAVERS COMPANY, Canadian representatives for **CAMBRIDGE WIRE CLOTH COMPANY,** manufacturer of woven wire conveyor belts, industrial wire cloth and special wire fabrications, has moved to new and larger quarters at 117 Charlton Ave., West Hamilton, Ontario, according to an announcement by R. D. Travers.

COMPANIES

An agreement contemplating the merger of Frederic B. Stevens, Inc., into The Udylite Corporation has been announced by the officers of the two companies.

The necessary formal agreements are in course of preparation and will be submitted to the respective boards of directors and stockholders of the companies in due course.

Frederic B. Stevens, Inc., was founded upwards of sixty-five years ago and for a great many years has been a leading producer of foundry supplies, polishing compounds, and various related products. It operates plants in Detroit, Michigan; New Haven, Connecticut; and Buffalo, New York, and through wholly owned subsidiaries operates plants in Windsor,

A Strippable Plastic for the Protection of Metals

Striplastic is a protective plastic applied by spraying, dipping or rolling. It is used on stainless steels, high polished metal sheets, sheets in cold working or drawing, tools, dies and parts, and on sheets or metal parts before packaging. It protects against scratching and abrasion, and against rust. Also available as a booth coat protection.

THE STRIPLASTIC COMPANY

Among many advantages, it is non-toxic, possesses great tensile strength and is easily stripped off in one piece. Write for complete information on this new strippable plastic.

10828 QUEBEC AVE.
CLEVELAND 6, OHIO

Ontario and Springfield, Ohio. Frederic B. Stevens, Inc., has offices and warehouses in principal cities and will continue its operations as a division of The Udylite Corporaton.

The Udylite Corporation is a leading manufacturer of plating machinery, supplies and equipment, and operates as well extensively in the production of automotive parts.

Due to the industrial growth of the Gulf States Region, **HERCULES POWDER COMPANY** has expanded the Dallas office of its Naval Stores Department. The office will now handle the sale of turpentine, pine oil, rosin, and rosin and resin derivatives, as well as toxaphene.

Field service representatives from the Canadian, Detroit, New England, New York, and Philadelphia sales divisions of **OAKITE PRODUCTS, INC.**, New York, N. Y., attended a series of technical-sales meetings at the Hotel Commodore, New York City, December 15-17. Highlighting these meetings were reports delivered by the company's research chemists and service engineers on latest trends in cleaning and related procedures designed to assist industry in combating rising production costs. Also reported upon were new materials to be made available by the company during the coming year.

Similar regional conferences held at the Sheraton Hotel, St. Louis, December 8-10, and the Biltmore Hotel, Los Angeles, November 28-30, were attended by representatives from Oakite's Chicago, Cleveland, Midwestern, Milwaukee, St. Louis and Southern divisions, and its North Pacific, South Pacific, and Southwestern sales territories, respectively.

According to an announcement by W. M. Reed, president, the **AMERICAN AIR FILTER CO., INC.**, Louisville, Ky., manufacturer of air filters and dust collectors, has merged with the **HERMAN NELSON CORP.**, Moline, Ill., manufacturer of heating and ventilating equipment.

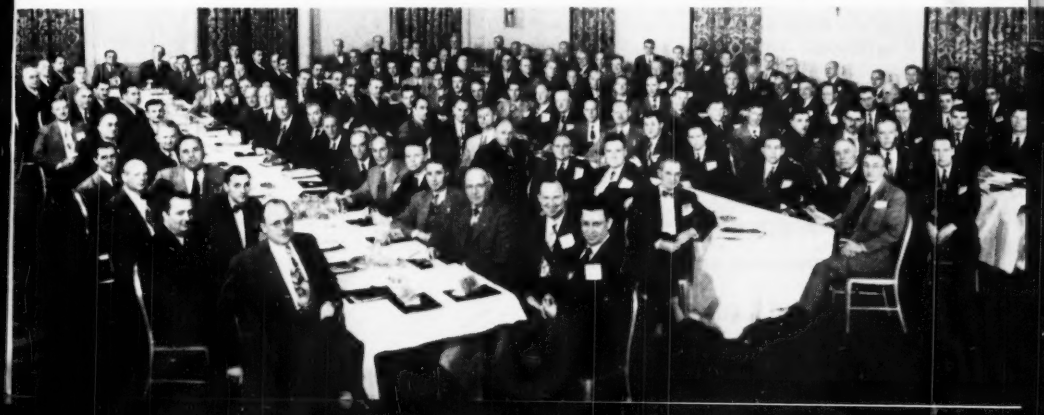
The Nelson Corporation henceforth will be operated as the Herman Nelson Division of American Air Filter Company, Inc., and will continue to maintain its headquarters and facilities in Moline. The merged company's principal offices and headquarters will be in Louisville.

W. G. Frank, executive vice president, and Richard H. Nelson have been elected directors of the combined firm. Richard H. Nelson and Robert W. Nelson have been elected vice presidents of the enlarged firm, and E. G. Mason, of the Herman Nelson Division, has been elected assistant secretary and assistant treasurer.

TEMCO, INC. is the new name adopted by the firm formerly known as the Tennessee Enamel Manufacturing Company, according to W. B. Evans, president. Organized in 1921 by Malvern H. Wright, now retired, and W. Bratten Evans, the company produces gas appliances and porcelain enamel signs.

In addition to Mr. Evans, the Temco management group consists of F. Donald Hart, executive vice president; L. E.

Field service representatives in attendance at the Oakite Technical Sales-Conference, Hotel Commodore, New York City, December 15-17



Nordholt, vice president in charge of engineering; Robert N. Smith, secretary-treasurer; and Frank Drake, sales manager.

The **FERRO ENAMEL CORP.**, Cleveland, Ohio, has announced the transfer of the manufacturing and distributing rights of its complete line of Ferro Cleaning Compounds to **MacDERMID INCORPORATED**, Waterbury, Connecticut. In making this announcement, Glenn Hutt, assistant to the president of Ferro Enamel, has advised that Ferro will now concentrate on newer aspects of the porcelain enameling field.

Ferro Metal Cleaning Compounds will be manufactured by MacDermid at its plants in Cleveland, Chicago, and Waterbury, with warehouse stocks also available in New York, Detroit, and St. Louis. Technical representatives and service men are located in these and other industrial areas. The sale of Ferro Metal Cleaners will be through regular MacDermid distributors in the Midwest and Southern States, and through MacDermid representatives in the Eastern States. However, Ferro Enamel will resell these cleaners exclusively to the porcelain enamel field. The West Coast will continue to be serviced by the Ferro Enamel Corporation of Los Angeles.

Louis K. Braunston has announced the formation of the **CHAMPION GLOVE CORPORATION** with factory and executive offices located at 850 Metropolitan Ave., Brooklyn 11, N. Y. The new firm, of which Mr. Braunston is president, will manufacture plastic coated industrial work gloves.

A special department has also been set up to coat wire, metal parts, cord, belting, tools, and so on, with the company's patented formulation process known as "Champlex."

Other officers are: Arthur A. Mayers, vice president and general sales manager; Henry R. Seidman, secretary and assistant sales manager; Morton B. Harley, factory superintendent in charge of production.

THE DuBOIS CO., Cincinnati, Ohio, manufacturer of specialized cleaning and processing compounds, has purchased

Industry's 3 Newest

COLD STRIPPERS

Fast! Economical! Safe! New!

"UNISOL"—for removing all baked enamels! Used cold—Non-inflammable—Non toxic—Strips baked enamels in seconds—Used for all type metals—Requires no rinse—Non-injurious to hands or clothing.

"UNISOL No. 2"—A new cold stripper for japans and vinyls—Non-inflammable—Strips tough japans and vinyls in matter of minutes—Used for all type metals.

"STRIPPER 202"—Something new for removing "stop-off" lacquers in seconds—Will not tarnish highly polished metal surfaces—Non-inflammable—Used cold—Non toxic.

Samples and further information supplied on request.

CHEMCO PRODUCTS CO., Inc.

7740 WEST 47TH STREET LYONS, ILLINOIS

(Left to right) John B. deBrun, Jack Malool, Philip H. Beach

the **GIANT PRODUCTS COMPANY** of Los Angeles.

The 15-year old Giant Company, whose products generally parallel those of The DuBois Company, has operated chiefly west of the Rockies, with the bulk of its sales force in Southern California. Its modern plant occupies a full city block adjacent to downtown Los Angeles, and includes well-planned loading and shipping facilities.

T. V. DuBois, president of the DuBois Co., pointed out that this purchase adds to the DuBois organization the facilities of a branch manufacturing plant, laboratories, and offices on the west coast.

"New Products for Better Cleaning" was the theme of a recent sales clinic conducted by the **COWLES CHEMICAL COMPANY** at its general offices in Cleveland, Ohio. All Cowles technical men in the Metal Cleaner Department participated in the three-day session, at which several new products were introduced to the sales staff.

Produced after months of research at the company's Research and Development Laboratory at Syracuse, N. Y., the first of the new products may be announced officially within the next few weeks.

Technical discussions were led by Dr. C. W. MacMullen, technical director, and Clarence G. Ozar of the Metal Cleaner Service Laboratory.

NEW POSITIONS

The Egyptian Lacquer Manufacturing Co., South Kearny, N. J., has announced several new steps in its manufacturing, sales, and service reorganization program.

An additional plant has been erected in Lafayette, Indiana, and an extensive rehabilitation program carried out at South Kearny, New Jersey. Important recent personnel changes and promotions include the promotion of **PHILIP H. BEACH**, veteran Egyptian salesman and formerly regional sales manager for New England, to the office of general sales manager.

Mr. Beach has been with Egyptian since 1931, serving first as a sales representative in Massachusetts and Rhode Island, then as an assistant sales manager. His headquarters will be in the South Kearny offices.

Transferred from the New York offices to assist Mr. Beach is **JOHN B. deBRUN**, whose official title will be assistant sales manager.

Another appointment is that of **JACK MALOOL** to the office of regional sales manager for the Metropolitan New York area. Mr. Malool is a familiar figure to many in the finishing industry.

Egyptian's sales structure is now divided into three major regions under Mr. Beach's direction. The first is the eastern region (including New England) under John deBrun; the second is the greater New York region under Jack Malool; the third is the midwestern region under Frederick Keller. This third division has its headquarters in Lafayette, Indiana.

George L. Wirtz, president of The Atlas Mineral Products Company has announced that **WILLIAM A. STREAKER**, a recent graduate of the University of Illinois has joined The Atlas Mineral Products Company as a chemical engineer.

A. J. EMMERICH, formerly salesman in the Detroit area, has been appointed sales manager of the J. J. Siefen Co., Detroit, Mich., manufacturer of liquid buffing and polishing compounds. Mr. Emmerich brings to his new position his extensive experience in the application of the company's products.

R. L. Shannon

R. L. SHANNON, formerly a district manager in the Metal Industries Department, The Diversey Corporation, Chicago, has been named promotional manager, according to an announcement by W. E. Noyes, general sales manager. He succeeds B. B. Button, who has been promoted to the position of special assistant to Mr. Noyes.

Mr. Shannon joined the Metal Industries Department six years ago, and after training, was assigned as a field service representative in the north Chicago sales territory. Subsequently, he was advanced to field, then district manager, taking over supervision and management of the entire Chicago sales territory for the Metal Industries Department.

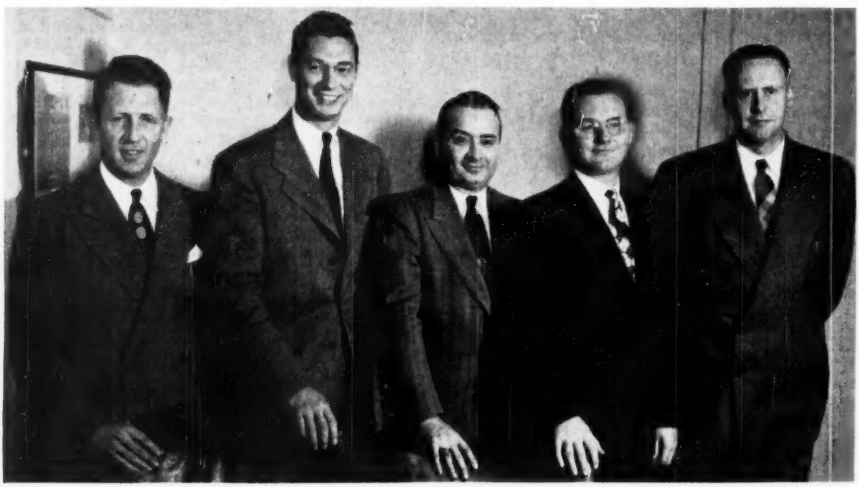
New field service representatives of the Department include: **FRANK E. SMITH, B. B. BUTTON** (sales training instructor), **D. F. SEYMOUR** (sales training instructor), **W. R. SWIFT,** and **C. L. HODGINS** (Diversey Corporation of Canada, Ltd.).

Promotion of the following five executives has been voted by the board of directors and announced by Howard P. DeVilbiss, president of The DeVilbiss Co., Toledo, Ohio:

WILLIAM A. DELGER, former plant manager, became vice president in charge of manufacturing; **DON J. PEEPS,** chief engineer, was advanced to vice president in charge of engineering; **JOHN M. ROBINSON,** treasurer, was elected vice president and treasurer; **FRANK R. PITT,** the company's legal counsel, was named secretary; and **R. MILES BOOTH,** member of the treasurer's staff, was appointed assistant secretary-treasurer.

Mr. Delger joined DeVilbiss in 1946 after service with an Eastern firm as a consulting management engineering supervisor. Mr. Peeps entered the company's employ in 1928 as a factory worker, becoming chief engineer in 1944. Mr. Robinson joined DeVilbiss in 1946 as treasurer, with a background of factory accounting and public tax and accounting work. Mr. Pitt is legislative chairman of the National Paint, Varnish and Lacquer Association.

JOHN JEPPSON, assistant secretary and a director of Norton Co., Worcester, Mass., has been appointed works manager of the company's Abrasive Division,



(Left to right) F. E. Smith, B. B. Button, D. F. Seymour, W. R. Swift, and C. L. Hodgins

according to an announcment by Milton P. Higgins, president.

Mr. Jeppson was formerly superintendent of Norton's newest manufacturing unit, Plant 7. In his new position, he will report directly to Andrew B. Holmstrom, vice president and general manager, Abrasive Division.

FRANK G. GIFFORD, manager of wheel plants, has expanded his responsibilities to include all the maufacturing operations in Plant 7 previously under the separate management of Mr. Jeppson.

JOHN R. BERGMAN has been named superintendent of Plant 7, reporting to Mr. Gifford. Mr. Bergman has been assistant superintendent of Plant 7 since it was opened in 1948.

Dr. George Zinzalian

E. F. Drew & Co., Inc., New York, N. Y., has appointed **DR. GEORGE ZINZALIAN** as sales manager of its Technical Products Division.

Associated with the Drew organization for over 16 years, Dr. Zinzalian will direct the activities of the Technical Products Division and the Textile and Leather Oils Departments.

Expansion in the sales and development activities of CMC, Hercules Powder Company's cellulose gum, has brought about two new assignments in personnel at Wilmington, Delaware. **LELAND H. BURT** has been named supervisor of CMC development and **WERNER C. BROWN,** supervisor of CMC sales.

Mr. Burt has been CMC product supervisor since 1946. He became associated with Hercules in 1943, and has been closely connected with the CMC development and sales program.

Joining Hercules in June 1942 as a chemist at the Experiment Station, Mr. Brown spent several years at the Hercules-operated Sunflower Ordnance Works in Kansas, returning to the Station in 1945 as a member of the Cellulose Products group. In April 1947 he became a supervisor of the Station Cellulose Products Division.

Carl Bauer, industrial sales manager of Standard Varnish Works, New York, has announced the appointment of **HUGH C. CRAWFORD** to the position of industrial sales promotion manager.

Hugh C. Crawford

Mr. Crawford has been active in the industrial finishes industry for many years and has held several important positions in sales and management. His efforts will be directed toward enlarging the sales of Standard's line of general industrial finishes.

ERNEST S. KOPECKI has recently joined the Pennsylvania Salt Manufacturing Company as a sales service representative in the Special Chemicals Department, Joseph J. Duffy, Jr., manager of the department, has announced.

Mr. Kopecki comes to Pennsalt with extensive experience in the field of metallurgy, having earned his degree of Bachelor of Science in Chemical Engineering at Marquette University and his Master's Degree in Metallurgy at Carnegie Institute of Technology.

L. O. Koven & Brother, Inc., Jersey City, N. J., manufacturer of tanks, special process equipment and weldments, announces the appointment of **KENNETH H. MacWATT** as director of engineering sales of the Koven organization. Mr. MacWatt succeeds W. D. Birch who resigned to assume more control of his many outside interests.

Kenneth H. MacWatt

Mr. MacWatt is a graduate of Stevens Institute of Technology with a degree of Mechanical Engineer.

Geo. A. Briner (left), James M. Hammock, John W. Nee

GEORGE A. BRINER, founder and president of the Briner Paint Manufacturing Co. Corpus Christi, Texas, recently announced the incorporation of the company and election of **JAMES M. HAMMOCK** as vice president for sales and **JOHN W. NEE,** vice president and technical director.

The company, organized in 1939, has been operated by Mr. Briner, a man well known to the paint industry for the past forty years.

Mr. Hammock, because of his long and successful sales experience in the industry, is well qualified to supervise the sales activities of the corporation in his new post.

John W. Nee, who recently resigned as technical director of the Napko Paint & Varnish Works, Houston, has spent 21 years in the protective coating industry. He is a member of the American Chemical Society, the American Institute of Chemists, and the National Association of Corrosion Engineers.

Almeda K. Briner is secretary of the corporation.

The Chemical Corp., Springfield, Mass., has announced that **JOHN KOSMOS,** a member of the Electrochemical Society and the American Electroplaters' Society, has joined its staff as technical service man, heading its new laboratory and available for consultation on the metal finishing problems of its customers.

Mr. Kosmos has been actively engaged in material control, process control, metallurgy, and metallography with such companies as Pratt & Whitney and Underwood. His educational background includes studies at the School of Technology at City College, New York, Connecticut School of Engineering, and a degree in engineering from Trinity College.

Appointment of **JOHN H. WEEKS** to the newly created position of director of personnel relations of the Glidden Company has been announced by D. P. Joyce, president.

Mr. Weeks, who has been serving Glidden as personnel director, will combine in his new capacity the offices of the personnel and industrial relations departments.

At the annual meeting of directors, E. O. Robson, president of Midland Industrial Finishes Co., Waukegan, Ill., announced that **G. E. BATZEL** and **M. A. GLAZER** have been elected vice presidents of the Company.

M. A. Glazer, G. E. Batzel

During the past four years Mr. Batzel has served as general manager and Mr. Glazer as technical director, and they will continue in these capacities.

MEETINGS

The **NEW YORK BRANCH** of the **AMERICAN ELECTROPLATERS' SOCIETY** will hold its Annual Educational Meeting (2:00 p.m.) and Banquet (7:00 p.m.) at the Hotel New Yorker on Saturday, February 25, 1950. The educational program will include papers on: "The Bright Dipping and Chemical Polishing of Metals," by Dr. Walter B. Meyer, president, Enthone, Inc., New

Haven, Conn.; "Galvanic Corrosion as Related to Electrodeposited Coatings," by The International Nickel Company, Inc., New York, N. Y.; "Barrel Plating," by Leonard A. Chesworth, chief chemist, United Car Fastener Corp., Cambridge, Massachusetts.

The **FIFTH ANNUAL EDUCATIONAL SESSION** and dinner dance of the **DAYTON BRANCH** of the **A.E.S.** will be held at the Hotel Biltmore on Saturday, February 25.

The educational session, beginning at 2 p.m., will feature the following papers: "Control of Plating Solutions by Hull Cell" by Jack Winters, R. O. Hull & Co., Cleveland; "Inside Story of Buffing Compounds and Buffing Wheels" by H. M. McAleer, president of the Formax Manufacturing Corporation; and "Fax Film Method of Comparing Surfaces," by R. W. Cook, president, Fax Film Corp., Cleveland.

The Toulmin Award and the Dayton Award will be presented at this session, and the award to the winner of the high school contest for the best essay on "How Plating Affects Our Daily Lives" will also be given.

A dinner at 6:15 will be followed by a floor show and dancing. William J. Neill, first vice president of the A.E.S., will serve as honorary chairman.

Tickets, at $5.00 each, may be obtained from Paul Geske, 41 S. Bromfield, Dayton, Ohio.

THE PAINT AND VARNISH EXCHANGE CLUB, INC., New York, N. Y., will hold its regular meeting on Tuesday, February 14, in the Taft Room of the Taft Hotel at 7 p. m.

SOCIETIES

The **38th ANNUAL EDUCATIONAL SESSION AND BANQUET** of the **CHICAGO BRANCH, AMERICAN ELECTROPLATERS' SOCIETY,** held in the Stevens Hotel on January 14, combined an instructive educational session with a most entertaining social program and served as an excellent indication that the A.E.S. National Convention to be held in Chicago in 1952 will be one of the outstanding conventions of the Society.

Among the many visitors from other cities were William J. Neill, A.E.S. first vice president, M. R. Caldwell and F. K. Savage, past presidents of the A.E.S., and many other branch officers and members from Milwaukee, Grand Rapids, Rockford, Indianapolis, and St. Louis.

The well-attended education session, directed by Dr. J. H. Monaweck, librarian of the Chicago Branch, included talks by R. O. Hull, R. O. Hull & Co., Cleveland; Dr. B. Knapp, International Nickel Co., New York; and Dr. William Blum of the National Bureau of Standards.

Mr. Hull discussed "Factors Affecting Throwing Power," mentioning in the course of his discussion the difference between throwing power and covering power (the lowest current density at which a deposit can be obtained), and illustrated his discussion by means of sample Hull Cell panels and graphs showing the results of some of his investigations.

He discussed in some detail a chrome plating difficulty known as "smears," generally caused by plating over "rainbows", and pointed out some of the reasons for passive nickel surfaces and ways to reactivate them. Through the use of the Hull Cell in connection with the study of throwing power of the chromium plating solution, it was found that a variation of the sulfate ratio would eliminate rainbows and smears. Stray currents, one source of difficulty, can be eliminated by proper electrical control of the bath or by insulation of one area of the bath from another through the use of diaphragms. One cause of difficulty was cited as the attack by chrome spray and solution on nickel as it is being lowered into the chromium plating solution.

Mr. Hull pointed out the value of the Woods acid nickel bath when used as a strike prior to bright nickel in place of the usual cyanide copper strike. This bath finds increased value in plants plagued with cyanide disposal problems because, by substituting the Woods bath for the cyanide copper bath, the cyanide disposal problem is solved.

Dr. Knapp illustrated his talk on the "Effect of Copper Under Nickel on Salt Spray Resistance" of the plate with many slides showing data in the form of charts and photographs of test panels. Some of the results of the investigation seem to indicate that: (1) copper under nickel plate produces a combination which has less resistance to the action of salt spray than does the nickel alone; (2) a copper film under the nickel is beneficial in the carbon dioxide-saturated hot water test; (3) a very thin flash coating of copper under the nickel seems beneficial, but on prolonged exposure causes the nickel to break down sooner than it should.

Dr. Blum spoke on the subject, "New Directions in Research," and expressed his opinion that plating research at the

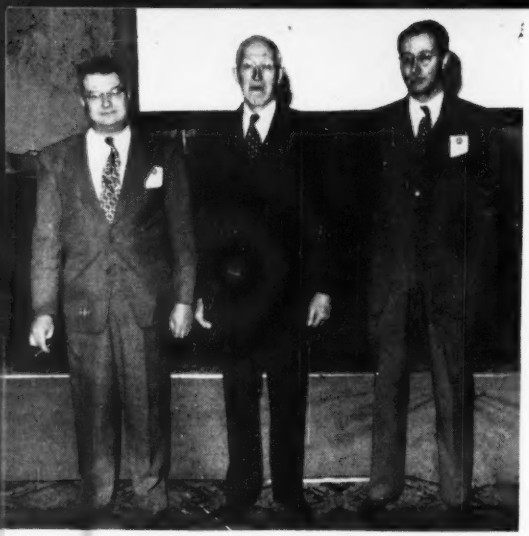


Fig. 1—Speakers at the Chicago meeting are (left to right): R. O. Hull, R. O. Hull & Co.; Dr. William Blum, National Bureau of Standards; Dr. B. Knapp, International Nickel Co.

present time is approaching the end of the possibilities for development because the various means of investigation (the "tools" of the research worker) have pretty well been exploited to the limit. Therefore, Dr. Blum outlined some of the ways in which future progress might be accomplished and these included: (1) the development of new tools for research; (2) the investigation and practical application of new metals to supplement the metals now being plated; (3) the use of radioactive tracer techniques in plating research (see page 42 of this issue of PRODUCTS FINISHING); (4) the use of

Fig. 2—A view showing some of the members and guests at the banquet following the Annual Meeting of the Chicago Branch, A. E. S.

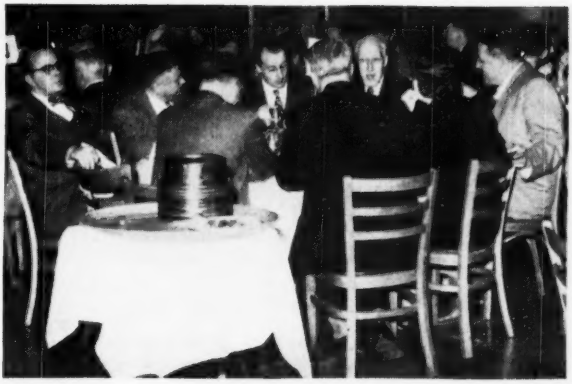


Fig. 3—Shown in this photo are: (left to right, facing camera) W. C. Dietrich, advertising manager of "Plating," R. O. Hull, Dr. B. Knapp, Dr. William Blum; (center, with backs to camera) William J. Neill, first vice president, A. E. S., and M. R. Caldwell, a past president of the A. E. S.

X-Ray to study crystal forms and structures; (5) the development of electron microscope techniques to study plating problems; (6) the use of the Spectroscope; (7) the use of the Oscillograph to study potentials and currents; and (8) the use of organic electrolytes to prepare solutions from which various metals can be plated.

Dr. Blum said that he believed almost every metal now known to science could be electrodeposited if the proper conditions could be established, and he mentioned the possibility that in electrodepositing some of the rare metals, properties of the metals not now realized might be secured.

During the educational session, William C. Geissman, general chairman of the 1949 Convention and now a member of the Rockford Branch, invited all those in attendance to be present in Rockford on March 18 for the annual meeting of that Branch.

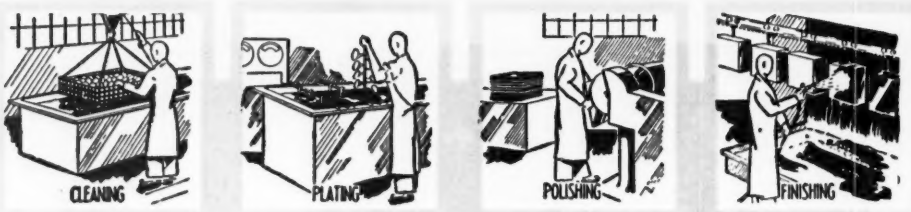
Phil J. Ritzenthaler of the Milwaukee Branch issued a similar invitation to the annual meeting of that Branch, to be held on April 29.

The banquet following the educational session was attended by some 950 members and guests. The accompanying photographs show some of those who enjoyed the excellent dinner and entertainment program.

The Chicago Branch Banquet Committee, under the leadership of R. J. Hazucka, consisted of C. Kocour, R. Ledford, H. A. Gilbertson, N. Longfield, C. Kelly, P. P. Glab (president), Dr. J. H. Monaweck (librarian), W. Carter, L. George, W. Zinn, and J. M. Andrus (secretary-treasurer), who are certainly to be congratulated on a successful meeting.

Fig. 4 — Some prominent members of the Chicago Branch, may be seen in this photo, among whom are: Clyde Kelly (extreme left), Dr. J. H. Monaweck, branch librarian and chairman of the Annual Educational Session, and P. P. Glab, branch president (extreme right).

(PRODUCTS FINISHING Staff Photos)



New • EQUIPMENT • MATERIALS • PROCESSES

Five-Cylinder Plating Barrel Unit

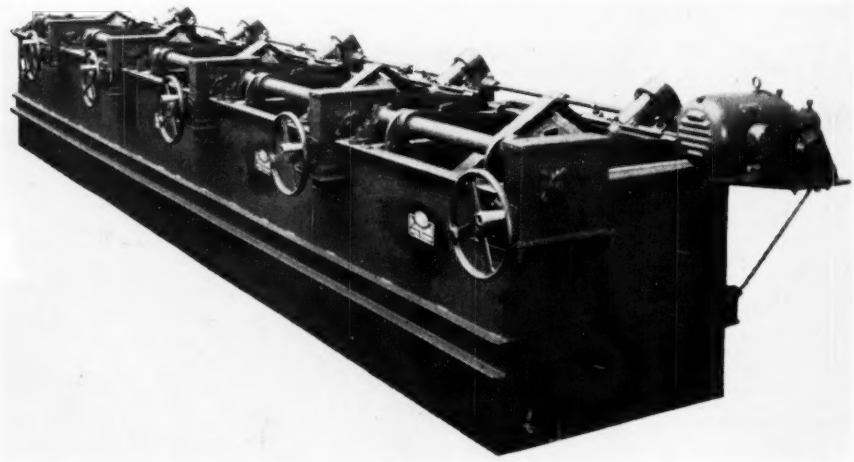
Daniels Plating Barrel and Supply Co., 129 Oliver St., Newark 5, N. J., has introduced a five-cylinder plating barrel unit having a common steel tank of double-welded steel construction, with or without rubber lining. The cylinders are made of either standard heavy reinforced Bakelite, molded rubber, or HT lucite. A feature of the machine is a newly designed ratio lift.

The unit can be fitted with two flanged overflows for maintaining solution levels and with flanged fittings for constant filtering lines.

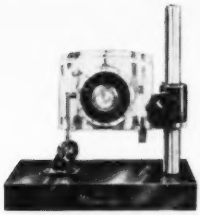
According to the manufacturer, advantages of the machine include: extremely high production, simplified filtration of solutions, great ease in handling work, efficient, rapid plating, and reduced maintenance by reason of the single motor drive.

Coating-Thickness Gage

A special purpose Magne-Gage for measuring the thickness of nickel coatings on iron or steel in the range of 0.001 to 0.0045 inch, by magnetic means, without injuring the coating or base metal,



Five-Cylinder Plating Barrel Unit



Coating-Thickness Gage

has been announced by the American Instrument Co., Inc., Silver Spring, Maryland.

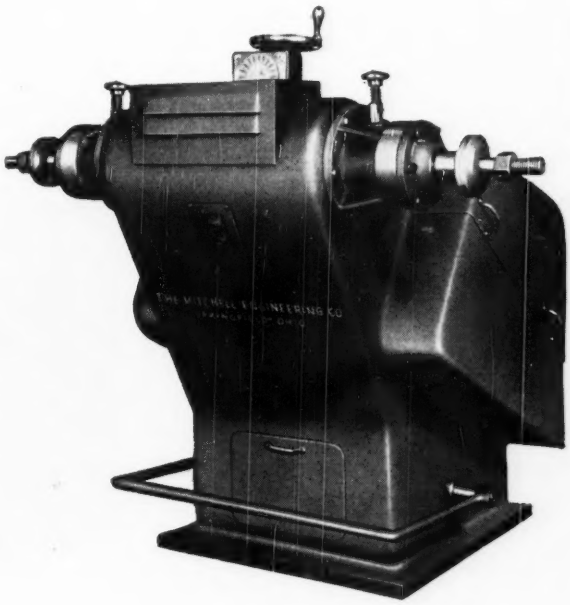
The thickness range is beyond that of the standard Magne-Gage (which measures thickness of nickel coatings on iron or steel from 0 to 0.002 inch) and cannot be supplied on gages having other calibrations.

Mitchell Variable Speed Polishing Lathe

Including an instant-safety foot brake and a unique split spindle, the Mitchell Variable Speed Polishing Lathe has been introduced by Frederic B. Stevens Inc., Detroit 16, Mich. Finger-tip variable speed control, from 1500 to 3000 r.p.m., permits a work variation from cut and color to satin finishing with no lost motion or delay.

According to the manufacturer, wheel and buff inventories can be minimized since the same variable control of peripheral speeds makes it possible to get the maximum use value out of every inch of wheels or buff.

Models No. 3-VSD with 3 h.p. motor and No. 5-VSD with 5 h.p. motor will take up to 4-inch faced wheels, and No. 7½-VSD with 7½ h.p. motor will handle up to 6-inch faced wheels.



Mitchell Variable Speed Polishing Lathe

Base XC 14 Dual Purpose Lacquer

A dual purpose lacquer, known as Base XC 14, for use on both cellulose acetate and cellulose acetate butyrate, has been developed by the United Lacquer Manufacturing Corp., Linden, N. J., and Everett, Massachusetts.

Base XC 14 is available in a clear finish or in colors in any desired sheen, and will air dry in a few minutes.

Paint Spraying Mask

For volume precision spraying of paint or lacquer on molded, cast, or stamped products of metal, plastic, and so on, an electroformed paint spraying mask is available from the Vertrod Corp., 17 Williams Ave., Brooklyn 7, New York.

By an eletrolytic process a strong shell is produced which accurately fits over the object to be processed. Designated areas are cut out of the shell to permit the paint or lacquer to pass through. Repeated spraying in these areas can be done without fogging or other defects, it is claimed.

Smaller objects can be volume pro-

Electroformed paint spraying mask and doll prior to spraying

duced in multi-cavity panels; by a series of progressive steps, and multi-color work can be done by inexperienced labor.

Marschke Buffing and Polishing Machine

The Vonnegut Moulder Corp., 1819 Madison Ave., Indianapolis 25, Ind., has announced its Marschke Buffing and Polishing Machine. Designed with the "underslung spindle," the following advantages are claimed for the unit:

Unusual rigidity of a relatively long, thin spindle is provided because the bearing support is entirely above the spindle. With this construction neither depth nor width of the overarm need be restricted; it may be as massive as required to obtain proper support for the end bearings, and these bearings may be located immediately adjacent to the wheel flanges with minimum spindle overhang.

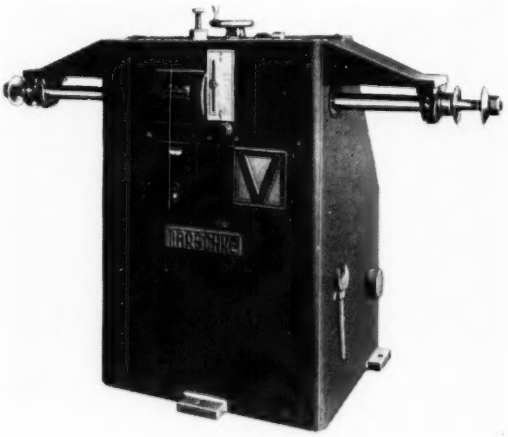
There are no structural interferences for spacing other bearings to best advantage along the underside of the bearing support or for locating the motor and power transmitting details.

The design and method of manufacturing the frame provides maximum dependability of accurate bearing alignment, as well as strength and rigidity.

Longer and larger bearing support arm can be furnished for longer spindles to meet special requirements.

The design of the unit provides complete freedom of operating action by eliminating all interferences under the spindle between the wheels and side walls of the base.

The Marschke Buffing and Polishing Machine is made with one and two spindles in various sizes with motors ranging from 1 to 30 horsepower.



Marschke Buffing and Polishing Machine

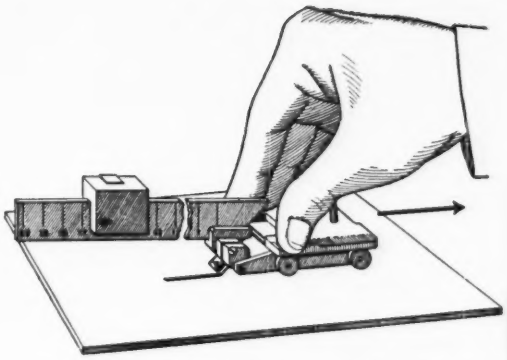
Hoffman Scratch Hardness Tester

A pocket-size tester that fills the need for an easy-to-handle small instrument for testing scratch hardness and adhesion of industrial product finishes has been designed by E. E. Hoffman of the Industrial Finishes Division, National Paint, Varnish and Lacquer Association, 1500 Rhode Island Ave., N. W., Washington 5, D. C. Because its reliable lever system reduces friction to one pivot, the instrument provides dependable determinations of the pressure on the scratching tool.

The scale of the tester is graduated from 0 to 20; each division equals 100 grams, permitting readings up to 2000 grams with a standard rider (weight) and up to 3750 grams with two standard riders.

For testing scratch hardness, all four wheels of the instrument are placed on the finished panel or surface and drawn

Drawing shows Tester being drawn from left to right. Tester follows roller carriage.



in a straight line across the film, using sufficient downward pressure to keep the wheels in contact with the surface. The scratching tool must follow, never precede the carriage. Tests are repeated, increasing or decreasing the weight on the scratching tool, until a just perceptible mark is made. Or, the size and character of the mark on various finishes with the same load on the scratching tool are compared. The surface must be reasonably level, but it is not necessary to use a level on it.

For testing adhesion, the same procedure is followed, but the weight on the scratching tool is increased until it breaks through the finish film and exposes the base surface. At this point the adhesion reading is noted.

To facilitate easy carrying, the instrument is dismantled into four parts: the carriage with pivot member and scratch tool; the beam; the standard rider; and the small rider.

A small rider is supplied to be used in combination with the standard rider to provide determinations of load readings with greater ease and accuracy.

The tester evaluates dried finishing films, and ensures dependable determinations in control testing, it is stated.

Strippable Coating SP-13

Designed expecially to provide a temporary protective coating on enameled, lacquered, and plastic parts, a strippable coating has been announced by Fidelity Chemical Products Corp., 470 Frelinghuysen Ave., Newark 5, New Jersey.

The strippable coating, designated as SP-13, is said to be a water dispersion compound of film-forming materials. The product does not contain volatile solvents. The dry film is non-flammable in character, elastic, tough, abrasive resistant, strongly adherent, yet subject to removal by a steady pull, the manufacturer states.

The coating material is shipped as a liquid and may be applied as received, by spraying with suitable spray guns. It is recommended that an atomizing pressure of 60 p.s.i. be used together with just enough pressure on the liquid to bring the material to the spray gun. For optimum results, SP-13 should be sprayed on the parts or panels to be protected, after which the panels should be dried at 140-150 deg. F. for about 15 minutes. A comparable film strength can also be attained through air drying for an hour if the film is permitted to remain on the panel at least 48 hours prior to peeling.

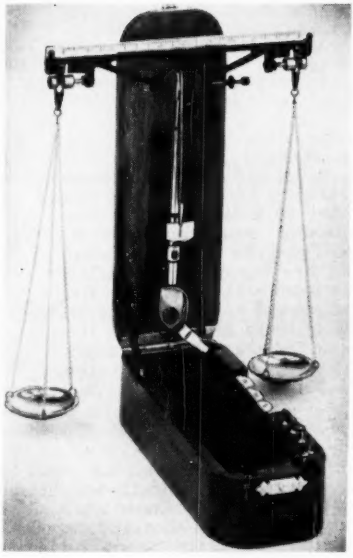
SP-13 is a light cream colored liquid with good stability, neutral pH, and a specific gravity of 1.28. The material contains 45-50 per cent solids, and, at a film thickness of 0.003 inch which is satisfactory for most purposes, approximately 300 square feet of surface may be covered with a gallon. The material must be protected from freezing and from heat, should be stored at room temperature (65-70 deg. F.), and should be used within 60 days after delivery, the manufacturer advises.

Voland Pocket Balance

Designed for field work of all kinds, an analytical balance known as the Pocket Balance has been introduced by Voland & Sons, Inc., New Rochelle, N. Y. An extremely sensitive weighing instrument, it is two-thirds the bulk of conventional models, is considerably lighter, and has been designed with rounded corners. It has a capacity of 20 grams, and can weigh up to 200 milligrams without small weights.

Similar to large models, the Pocket Balance can be adjusted in the same way as ordinary analytical balances by turning the adjusting nut at the right end of the beam, which beam is graduated and carries a rider. The sensitivity is 2 milligrams.

According to the manufacturer, an additional feature of the instrument is that its pans hang from fine jewelry chain instead of string.



Voland Pocket Balance

"Kem-Ban"

Specially designed to meet the demands of myriad maintenance coating and production-finishing applications throughout the manufacturing, metal-working, chemical processing, and finishing industries among others for effective protection of exterior surfaces exposed to atmospheric and other corrosive conditions, a new rust-inhibitive, protective-coating compound is announced by Ace Laboratories, 1614 Coutant Ave., Lakewood 7, Ohio, producer of specialty finishing materials, adhesives, paints, coatings and industrial organics.

This new multi-purpose protective paint, called "Kem-Ban," is based on a specially selected copolymer as the binder and incorporates certain key rubber derivatives as plasticizers. The formulation is said to provide both effective rust-inhibiting action and excellent resistance to acids, alkalies, chemical fumes, moisture, salts and alcohols.

Applied by spray, dip or brush methods, Kem-Ban dries in from 20 to 30 minutes. The resultant coating is a fire-retardant film of uniform thickness and high hardness, yet of sufficient elasticity to cope with the expansion brought about by temperature changes. Consequently, the coating produced will not check, peel, or crack, it is said. Depending upon film thickness desired, the material can be reduced for application from 20 to 50 per cent with ordinary turpentines.

TWENTY-SEVEN YEARS OF QUALITY

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BUFFING *and* POLISHING COMPOUNDS

for all types of metals

CUTTING, CUT AND COLOR, AND MIRROR-FINISHING COMPOUNDS

EASY WASH

in cake and dip form

QUALITY — PRICE — SERVICE

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Mercury Thermal System

A 1200 deg. F. Mercury Thermal System for applications which require measurement and control of temperatures above 1000 deg. F. is now being offered by the Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y. Gas-fired ovens, glass annealing ovens, high temperature blanchers, and the measurement of exhaust gases are a few of the many applications which this system will accurately serve, the manufacturer states.

Outstanding features of the unit include a newly developed Bourdon type spring, type 347 stainless steel thermal element, compensation for varying case and ambient temperatures, and uniformly graduated charts.

Eclipse Extension Spray Gun

An extension spray gun for industrial maintenance painting capable of reaching to the second-story level has been developed by the Eclipse Air Brush Co., 390 Park Ave., Newark 7, N. J. Offered in lengths at 2-foot intervals from 4 to 12 feet, the gun is light in weight, a 6-foot extension weighing only 4 pounds,

Eclipse Extension Spray Gun in use

and can accommodate any sprayable fluid from light paints to heavy asphaltic compounds.

YOUR SIGNAL!

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Clear Metal Lacquer

... FOR ...

SILVER, CADMIUM, ZINC, COPPER, BRASS, ALUMINUM

Outstanding

1. **Adhesion to metal surfaces**
2. **Resistance to sulfur tarnish**
3. **Resistance to oxidation**
4. **Resistance to perspiration**
5. **Resistance to abrasion**

Pale in color. Takes 100-200% reduction. Dries under 15 minutes.

A premium product—priced at ordinary lacquer levels.

The Varnish Products Company

5208 Harvard Avenue **Cleveland, Ohio**

Black & Decker 7-Inch Junior Sander

The Black & Decker Mfg. Co., Towson, Md., has announced a new lightweight portable electric tool, the 7-inch Junior Sander, designed especially for service in shops requiring only intermittent sander use. Recommended for light sanding, metal finishing, touchup body work, removing rust, and similar light-duty operations, the 7-inch Junior Sander is a side-handle model with a convenient reversible auxiliary side handle for either right or left handed use. The tool is rugged but light, weighing only 8 lb. Housings are aluminum castings, and heat-treated gears and grease-sealed ball-bearings are used throughout. The no-load spindle speed is 3500 revolutions per minute.

This new sander is equipped with a convenient spindle locking pin for speedy changing of sanding discs and other attachments. Other standard equipment includes a 7-inch molded rubber pad, three 7-inch sanding discs (1 coarse, 1 medium, 1 fine), clamp washer, and 3-con-

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As experts with many years of experience Young and Bertke engineers can show you how to effect substantial savings in your finishing department.

We design, manufacture, and install finishing systems, ovens, spray booths that will do the best possible job for you at the lowest cost.

This is no idle boast. Your best guarantee of our ability to help you is our record of saving among leading manufacturers where we have installed finishing systems recently. Let us show you how we can help you, too. We would like to consult you on your ovens, spray booths, fume, dust removal or complete finishing systems.

OVENS — SPRAY BOOTHS — FINISHING SYSTEMS

The YOUNG BERTKE Co.

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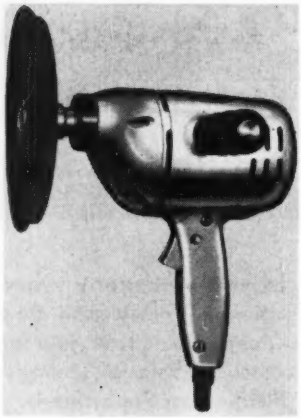


Black & Decker 7-Inch Junior Sander

ductor cable and plug. It is powered by a Black & Decker universal motor for operation on alternating or direct currents and is available for 115 or 220 volts. On special order 125 or 240-volt motors can be supplied.

Protective Coating

A removable protective vinyl coating designed to prevent corrosion, scratching, or abrasion of metals during production, assembly, shipping, or storage has been introduced by Specialty Coatings Laboratory, 1721 N. Water St., Milwaukee 2, Wisconsin.

The coating is custom-formulated to meet specific end uses, such as masking or stop-off lacquers and protective films for polished metals. For the latter application, a corrosion-inhibitive composition has been developed to retard underfilm corrosion, the manufacturer states.

The coating is applicable by spray, brush, or dip methods and is available in clear and a variety of colors, both translucent and opaque. A sprayed coating has a coverage of 250 to 300 square feet per gallon per mil thickness. It can be air-dried or force-dried to provide a high degree of protection against weather, corrosive elements, ageing, and abrasion. The coating can be peeled off whenever desired, leaving a clean dry surface, or it can be obtained in an adherent type for permanent protection.

Mixed Bed Demineralizer

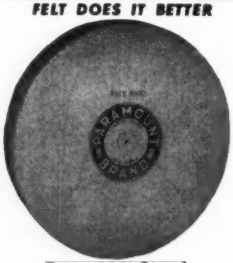
Development of Mixed Bed (cation-anion) Demineralizing equipment has been announced by the Illinois Water Treatment Co., Rockford, Ill. According to company officials, the Illco-Way mixed bed unit produces a chemically pure water containing less than one part per million total solids, having a pH of 7 and resistances of over 10 million ohms per cubic centimeter.

Other advantages claimed for the Illco-Way mixed bed unit are that it requires less regeneration time, less installation space and a lower initial investment than two or four-bed demineralizers.

Dry-Flo

National Starch Products, Inc., New York, N. Y., has announced a hydrophobic derivative of corn starch which is now available for product research and development. Called Dry-Flo, it is a finely divided powder with a silky texture, free-flowing to the extent that in many ways it behaves like a liquid. The presence of the hydrohobic groups makes Dry-Flo

FELT DOES IT BETTER



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Order PARAMOUNT BRAND Felt Wheels from your supplier. Also, bobs and sheets whenever you need them.

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Nickel plated steel scissors stripped clean and bright without attack.

new Developments For Metal Finishing

METAL STRIPPER "A" — An alkaline chemical stripper for removing coatings of nickel, copper, zinc, cadmium and silver from steel *without any attack* upon the steel. Excellent for removing plated coatings as well as surplus metal from brazing or welding.

CLEANER S-61—A new alkaline soap-type cleaner that is remarkably effective even at temperatures as low as 150° F. for removal of oil, grease, and bu'fing compounds from copper and steel.

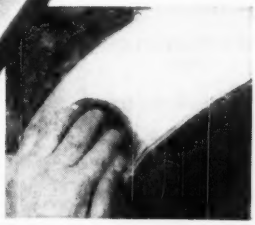
EBONOL "S-30" — A new quick blackening process for iron and steel. Produces jet black coatings in five minutes.

INHIBITOR 9—A new inhibitor for both hydrochloric and sulphuric acids for pickling of steel without attack. Saves acids. Also inhibits against hydrogen embrittlement.

NYLON ANODE BAGS—New nylon anode bags for nickel, copper, silver and other plating solutions. Made to specifications.

"SURPREP"—A new phosphating type cleaner for rapid removal of rust, oil and grease from large objects. Can be applied by brushing, wiping or spraying.

Write for New Bulletins on these Products



• *Fast action of SURPREP on oily steel*

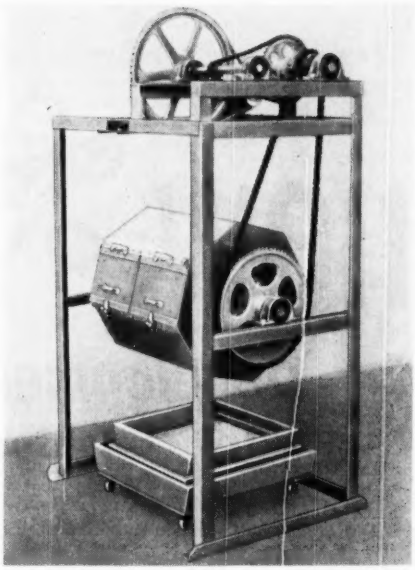
Enthone INC.
442 Elm Street, New Haven, Conn.

extremely difficult to wet with water under ordinary conditions; it can be wet with water if a wetting agent is used or if the dry material is first wetted with alcohol or other water-miscible solvents.

Potential applications listed by the manufacturer include: flatting agent in lacquers, detackifying agent for rubber articles formed by the dip method, prevention of sticking of viscous materials to container walls, lubricating agent, and so on.

Improved "Tumb-L-Matic" Tumbling Machine

A new and improved tumbling machine has recently been announced by the Lupomatic Industries, Inc., 4510 Bullard Ave., New York 66, N. Y., manufacturer of "Tumb-L-Matic" processes, equipment and supplies. One of the main improvements over former models is the mounting of the bearings on the raised frame for positive direct support of all drive mechanisms. Ball bearing equipped throughout, the shaft housings are now supported by the frame itself, thus providing an even more rugged and substantial construction. Chain gear drive with constant speed motor assures an unvarying steady power at all times, an essential factor in all tumbling processes.



Improved "Tumb-L-Matic" Tumbling Machine

When a change of work calls for a different speed, the unit can be readily converted to the speed required. All parts of the machine are readily accessible for easy lubrication and simple maintenance. This model is especially designed to handle such "Tumb-L-Matic" processes as deburring, definning, cutting, smoothing, polishing or surfacing metals for plating, or subsequent finishing operations.

McKeon's

Zinc-Brite

added to your zinc plating solution will:

1. **Precipitate heavy metal impurities.**
2. **Increase the life of your brightener.**
3. **Improve the luster of your deposit.**

It is compatible with the brightener you are now using.

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Sulphur Products Co.

Greensburg 6, Pa.

Vinyl-Cote

Called Vinyl-Cote, an impervious chemical tank lining which does not blister or peel has been introduced by The Glidden Co., 11001 Madison Ave., Cleveland 2, Ohio. Field tests show that it combats corrosion and withstands salt water, alkalies, acids, and corrosive gases and fumes.

Not specified for some applications, it is said to be readily soluble in the ketone and ester group of solvents, and its resin

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Model E2PF

Users of Hammond Junior Automatics report 3 to 7 times faster finishing than hand methods. The Operator merely loads and unloads the machine, result . . . . faster, better and more uniform finishing, more pieces per hour with less operator fatigue.

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films will not withstand operating temperatures above 180 deg. Fahrenheit.

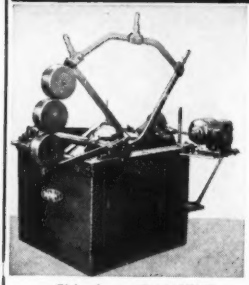
Vinyl-Cote is a five-coat system, with each coat a different color. When the coat being applied completely covers the previous coat, the proper thickness has been attained.

Controlled Oxidation Pentrate

Heatbath Corp., P. O. Box 78, Springfield 1, Mass., has developed a two-component black oxide process known as Controlled Oxidation Pentrate. One package contains a granular mixture labeled Pentrate SS which is used in making up the original bath and also serves to replenish dragout losses. The other package contains compressed briquettes called Pentrate Brix, which are a new combination of oxidizers, activators, and inhibitors. According to the manufacturer, Brix are used in very small amounts to maintain a constant bath strength.

Features claimed for the process include: oxidizing power can be controlled; deep jet black colors are imparted to steel very rapidly and the process can be operated in single or double baths at temperatures between 265 and 315 deg. Fahrenheit.

At your Service



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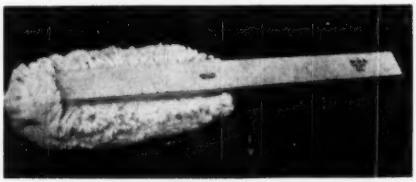
Featuring cotton wicking which is anchored by a twisted stainless steel base wire, an improved Cotton Potash Brush



H-VM-M No. 9819-A Cotton Potash Brush

has been developed by Hanson-Van Winkle-Munning Co., Matawan, N. J. Originally available only in a straight handle brush known as No. 9819-A, it has been applied to a curved handle brush designated as No. 9860-A.

Advantages claimed for the brush include: 20 per cent more cotton than standard; generous amount of cotton wicking around the end of the block; neatly trimmed; and stainless steel wire which is resistant to attack by commonly used solutions.

PRODUCT LITERATURE

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning PRODUCTS FINISHING when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

"Where Isn't A Finish" is the title of an eight-page pamphlet published by the National Paint, Varnish and Lacquer Association, Inc., Washington, D. C., which amusingly points out where hundreds of finishes are encountered during the average day.

Mechanical Finishing. Equipment and methods for mechanical finishing, deburring, polishing, Britehoning, and coloring various metals are described in an illustrated bulletin available from the Roto-Finish Company, Kalamazoo, Michigan.

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These **GREASELESS COMPOUNDS**, like all **MOCO** compounds, are designed to give **economical, efficient** service

The Mosher Company
Chicopee, Massachusetts

Stevens Mitchell Variable Speed Polishing Lathe. Bulletins giving descriptions and specifications for Models 7½-VSD, 3-VSD and 5-VSD Mitchell Variable Speed Polishing Lathe are available from Frederic B. Stevens Incorporated, Detroit, 16, Michigan.

General "Prep Products" Brochure No. 50-60. The Neilson Chemical Co., 6561 Benson St., Detroit 7, Mich., has prepared a comprehensve brochure covering each of its many conditioning materials, which is available only to paint technical, service and sales engineers, production managers, process engineers, and paint superintendents or consultants. Each bulletin included covers the type of applications for which a specific product is used and gives a description of the material itself, the type of coating which is left on the various metal surfaces, and other pertinent information concerning the material.

Products for pre-paint treating of iron, steel, aluminum, terneplate, galvanized iron, zinc base die castings, and zinc plated surfaces are described, and conditions for their successful application specified.

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Despatch Water Wash Spray Booths are the subject of Bulletin 66 prepared by the Despatch Oven Co., 619 S. E. 8th St., Minneapolis 14, Minn. Specifications, construction features, line drawings and photographs are included in the four-page bulletin.

Dip-Duranite. A two-color folder illustrating its Dip-Duranite quick baking enamels for mass production metal product finishing can be obtained from the Zapon Division, Atlas Powder Co., Stamford, Connecticut.

Metal Polishing with Backstand Belts. Behr-Manning, Troy, N. Y., has available an eight-page brochure describing its Metalite Cloth Belts, their features, applications, and advantages. Drawings and application photographs complete the text.

Diamond Chromium Chemicals. A 32-page handbook on chromium chemicals, clearly depicting their general use and diversified applications in more than 17 different industries, has been prepared by the Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio.

Spiral bound, of 8½ x 11-inch size for filing, the brochure presents complete and concise data on bichromate of soda, its manufacture, and its principal uses, including "red dipping" of brass and other copper-base alloys following annealing; treating magnesium, tin plate, and aluminum to increase corrosion resistance; inhibiting corrosion in water-cooled or water-circulating equipment, and so on.

Helpful charts and tables list conversion formulas, tank capacities, and graphical data.

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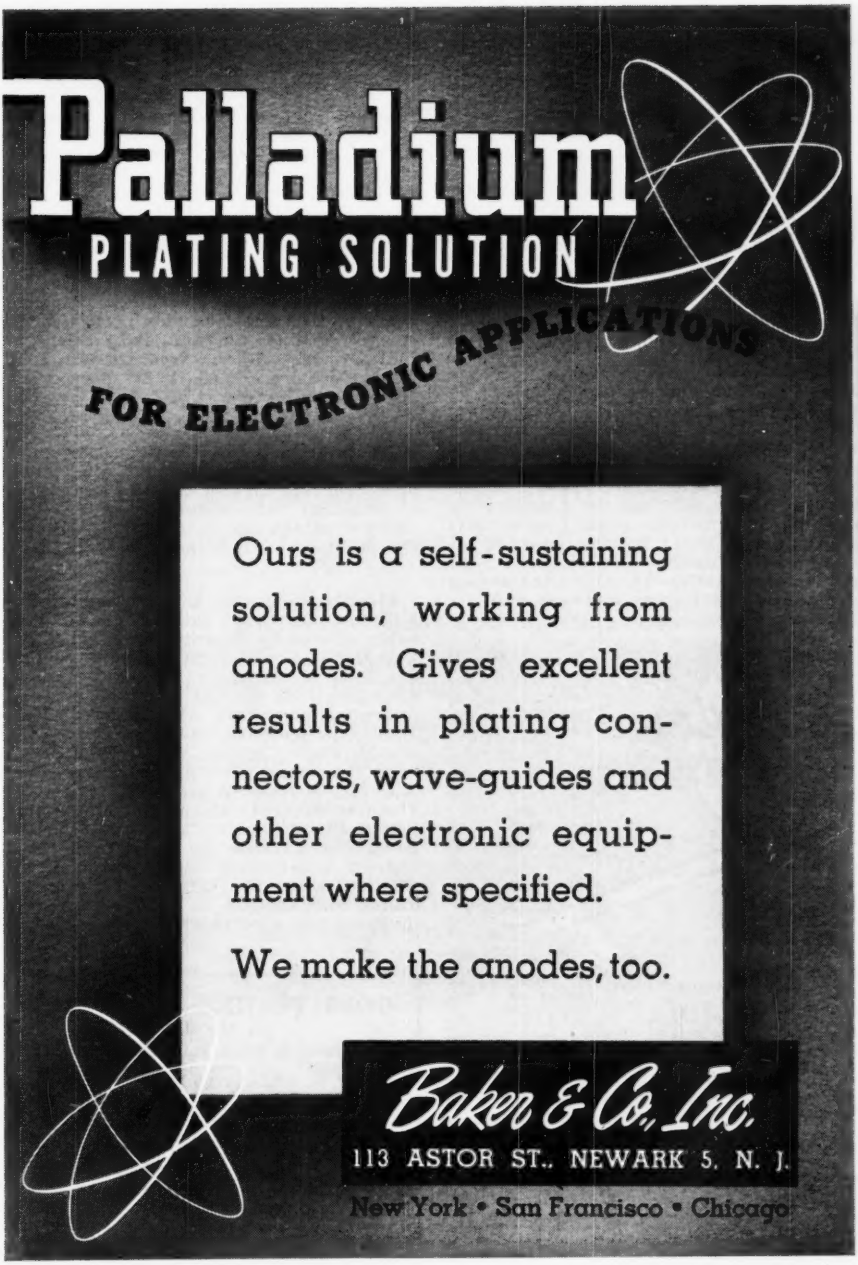
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Production Bulletin No. 9, describing and illustrating the Production Type A Polishing Machine for polishing, finishing, buffing, and sanding rods, bars, and tubes, has been issued by the Production Machine Co., Greenfield, Massachusetts.

Dampney Silicone Coating Aluminum, a protective surfacing for metal exposed to heat or weather, is thoroughly described in Bulletin 1570 released by The Dampney Company of America, Hyde Park, Boston 36, Massachusetts.

Nitrocellueose Packaging and Paper Lacquers, a 32-page booklet prepared by the Hercules Powder Co., Wilmington, Del., includes a description of the formulations and materials used in the research on nitrocellulose packaging and paper lacquers and detailed results of the investigations. Sections on heat-sealing coatings and moistureproof heat-sealing coatings are also included, as well as suggested starting formulations for paper-coating lacquers. Also cited are an explanation of testing methods and description of lacquer components, solvent, paper-coating method, and coating cycle used in the research.

Schori Technical Bulletin No. 103D, describing in full detail the method of applying polyethylene to metal surfaces, can be obtained from the Schori Process Division, Ferro-Co Corp., 8-11 43rd Rd., Long Island City 1, N. Y. Included are tables showing the results of one-year tests on a long list of chemicals.

Kotron Selenium Rectifiers. Leaflets containing engineering data pertaining to its power selenium and strip selenium rectifiers are available from the Standard Arcturus Corp., 54 Clark St., Newark 4, New Jersey.

Plastic Strippable Coatings, specially designed temporary coatings applied by spray, brush, or dip, are the subject of a technical data sheet issued by Specialty Coatings Laboratory, 1721 N. Water St., Milwaukee 2, Wisconsin.

Fidelity Products. A folder containing bulletins on their various products is being offered by Fidelity Chemical Products Corp., 470 Frelinghuysen Ave., Newark 5, N. J. Among others, descriptions and directions for use are given for the following products: Aluminum Cleaner No. 9, Stripper No. 11, General Cleaner No. 15, Floor Cleaner No. 55, Pine Scrub Soap No. 63, Sanitizer and Deoderant No. 452, Zipsol Metal Cleaner No. 74 (Degreasing Solvent) Motor Flushing Compound, Steam Cleaner No. 124 X, Medium Duty Steel Cleaner No. 125, Heavy Duty Platers' Cleaner No. 170, Peelable Spray Booth Coating No. 483, and Organic Alkaline Stripper 527. In all, there are 39 bulletins included in this folder.

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Testing Apparatus. A four-page leaflet illustrating and describing miscellaneous testing apparatus can be obtained from Henry A. Gardner Laboratory, Inc., Bethesda 14, Md. Information is included on a Mandrel Set for paint flexibility tests, tensile strength and elongation apparatus, improved sand abraser, Hart impact tester, Universal drying rack for paint panels, touch controller, and 3-roll laboratory mill.

Tesco Chemical Compounds. Tesco Chemicals, Inc., 1575 North Side Drive, N. W., Atlanta, Ga., has prepared a technical bulletin describing its chemical compounds for cleaning, conditioning, paint stripping, corrosion proofing, and paint bonding of metals preparatory to painting, vitreous enameling, and plating.

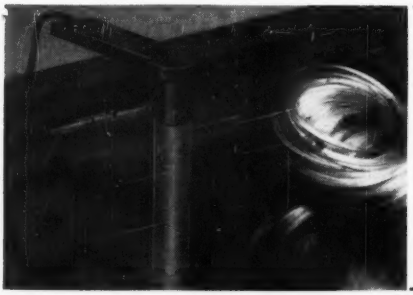
NEW BOOKS

Spectrophotometry (Circular 484). By Kasson S. Gibson. Published by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 48 large double-column pages. Illustrated. Price, 25 cents; foreign, 33 cents—United States currency.

Techniques and data resulting from the extensive experience by the National Bureau of Standards in spectrophotometry are presented in this guide so that users of spectrophotometers can better understand their instruments, calibrate and maintain them in the proper operating condition, and guard against the numerous errors common in such work. Instruments and methods for use in the ultraviolet, visible, and near-infra-red spectral regions are considered, including photographic, visual, and photoelectric methods. Important topics covered include definitions of spectrophotometric terms, essential parts of spectrophotometric work, and presentation of standard data for checking the calibration of spectrophotometers. In addition, a bibliography of 127 related references is given.

36th Annual Proceedings of the American Electroplaters' Society. Published by the American Electroplaters' Society, Box 168, Jenkintown, Pa. 272 pages. Illustrated. Cloth binding, board covers. Price, $5.00.

This volume presents a record of the technical sessions of the 36th Annual Convention of the American Electroplaters' Society, held in Milwaukee from June 28 through July 1, 1949. It provides a record of the Convention proceedings, as well as a complete presentation, with photographs, of each technical paper and the discussion following the presentation. The various committees of the American Electroplaters' Society are listed, as well as the A.E.S. Branches, and other informative data concerning the Society and its functions.



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Reliable and well-advertised firm manufacturing protective coatings for metals requires representation in some areas Sales and industrial experience desirable but not absolutely necessary. Straight commission. No objection to non-competing lines. Reply in confidence giving age, business experience and other information you consider important. Write Box 23, c/o Products Finishing, 431 Main Street, Cincinnati 2, Ohio.

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This position is open for a qualified individual who wishes to associate himself with a well established firm manufacturing a complete line of lacquer and synthetic finishing materials in the metropolitan New York area. Please send full particulars concerning experience and qualifications. All replies treated in strictest confidence. Box No. 25, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio.

Will BUY your dirty THINNERS and SOLVENTS. Send sample or letter giving approximate contents and solids. The Johann Company, 633 East 138th Street, Dolton, Illinois.

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Wanted for midwestern plant of firm manufacturing complete line of lacquers and synthetics. Please send complete information concerning experience, education, etc. to Box No. 26, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio. All replies confidential.

Stain-Filler Formulator wanted by Midwestern manufacturer of complete line of wood finishing materials. Knowledge of wood lacquers preferable. Must be progressive and alert. Salary commensurate with experience and abilities. Write Box No. 28, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio.

"HELP WANTED"

Industrial finishes salesman wanted by midwest manufacturer of industrial finishes to cover the State of Michigan. Box 22, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio.

Synthetic Formulator wanted. Established manufacturer of industrial finishes requires chemist with sound background in the formulation of synthetic finishes. Must be alert to new technical advances. Salary commensurate with experience and abilities. Write Box 29, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio

Industrial Finishes salesman wanted by national manufacturer to cover Pittsburgh, Pennsylvania, territory. Write Box No. 24, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio.

INDUSTRIAL FINISHES CHEMIST

Services required in eastern division of firm manufacturing all types of industrial finishes. Please send full particulars concerning qualifications to Box No. 27, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio.

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Wanted in certain territories to sell Schaffner's Buffing Compositions and Supplies. We specialize in White Finish (Lime Composition), Grease Stick, Tripoli, Emery Cake, etc., in "Bar or Liquid Form." All up to 100% saponifiable. These items can all be made to fit your particular customers' requirements. No account is too small or too large, for our individual attention. SCHAFFNER MANUFACTURING CO., INC., Schaffner Bldg., Pittsburgh 2, Pa.

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This well established lacquer and synthetic finishes manufacturing company is expanding its sales operations and requires the services of two technically able paint sales engineers with a following. Location within twenty-five miles of Phila. Area to be covered to include N. Y., N. J., New England, and parts of Pa. This is an excellent opportunity well worth investigating. Write in strict confidence with complete information to the American Lacquer Solvents Co., P O. Box 271, Phoenixville, Pa.

Catalogs

FOR YOUR LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Recording Thermometer
A bulletin available from The Bristol Co., Waterbury 81, Conn., describes the construction and operation of the Traveling-Recording Thermometer and points out uses for the instrument in production shops performing baking operations.

2. Synpex Enamels
M & W Technical Data Bulletin No. 106, distributed by the Maas & Waldstein Co., Newark 4, N. J., describes the physical properties of Synpex Enamels together with instructions for their application.

3. Black Finishes
A "Black Book" describing details of Zinc Black and other Black-Magic metal finishes has been published by the Mitchell-Bradford Chemical Co., Stratford, Bridgeport, Connecticut.

4. Polishing Wheels
Bulletin W-102 describing its complete line of polishing wheels and accessory products has been prepared by the Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

5. Emulsion Cleaner
Mul Emulsion Cleaner is described in a folder issued by The DuBois Co., Cincinnati 3, Ohio, in which properties and suggested uses of the product are outlined.

6. Backstand Belts
"Facts About Backstand-Belt Grinding and Polishing" are enumerated in a booklet being distributed by Armour & Co., Chicago 9, Illinois.

7. Aluminum Finishes
A 64-page manual entitled "Finishes for Alcoa Aluminum" is available from the Aluminum Company of America, Pittsburgh 19, Pennsylvania.

8. Centrifugal Dryer
The New Holland Machine Co., New Holland, Pa., has published a bulletin providing complete specifications of the New Holland Kreider Centrifugal Dryer and describing typical installations.

9. Infra-Red Brochure
The Fostoria Pressed Steel Corp., Fostoria, Ohio, has published Brochure EV-1146 which illustrates and describes the use of the Fostoria Evenray System in industrial heating applications.

10. Industrial Wire Cloth and Screens
K-P Catalog No. 36, issued by Korb-Pettit Wire Fabrics and Iron Works, Inc., Philadelphia 22, Pa., describes by means of illustrations and data tables the many types of industrial wire cloth and woven wire screens manufactured by the company.

11. Gold Plating
An instruction booklet describing gold coloring solutions for various shades of gold is now being issued by Baker & Co., Inc., Newark, New Jersey.

12. Duranite H Folder
A folder outlining field results and laboratory tests made on its new organic finish, Duranite H, and extending over a two-year period is available from the Industrial Finishes Dept., Atlas Powder Co., Wilmington 99, Delaware.

13. General Purpose Fans
"General Purpose Fans" is the title of an eight-page bulletin designated as Bulletin 481 distributed by the New York Blower Co., Chicago 16, Illinois.

14. Flock Color Card
A color card containing samples of flock finishes has been issued by the Rayon Processing Company of Rhode Island, Inc., Central Falls, Rhode Island.

15. Metal Lacquers
"Is There A Better Metal Finish Than The One You Now Use?" is a booklet issued by The Egyptian Lacquer Mfg. Co., Newark, N. J., describing six clear lacquers for metal.

16. Chemifinishes
General information concerning the finishing of metals with Du-Lite materials is contained in literature prepared by The Du-Lite Chemical Corp., Middletown, Connecticut.

17. Electric Radiant Heaters

The Edwin L. Wiegand Co., Pittsburgh 8, Pa., has available Bulletin CS-603 which describes the construction of Chromalox heaters and lists the uses, operating characteristics, and advantages of the infra-red units.

18. Temperature Controls

Self-operated temperature controls for plating and finishing applications are described in Catalog No. 650 available from the Sarco Co., Inc., New York 1, New York.

19. Deburring and Finishing Equipment

"Cut Labor Costs ½ or More" is the title of a bulletin issued by Almco, Division of Queen Stove Works, Inc., Albert Lea, Minn., describing the complete line of Supersheen deburring and finishing barrels, equipment, and supplies.

20. Striplastic No. 320

A bulletin describing the properties and applications of Striplastic No. 320 is available from the Striplastic Co., Cleveland 6, Ohio.

21. Cleaning and Phosphatizing

Four convenient reference file folders under the headings of Paint Removal, Phosphate Coatings, Metal Cleaning, and Spray Booth Maintenance, which contain descriptions of the complete line of various compounds and chemicals available from the company, can be obtained from Klem Chemicals, Inc., Dearborn, Michigan.

22. Protective Coatings

"Ucilon" Specialized Industrial Coatings for the protection of metal, concrete, and wood are the subject of a four-page folder prepared by United Chromium, Inc., New York 17, New York.

23. Finishing Equipment

The Despatch Oven Co., Minneapolis 14, Minn., has prepared Bulletin C-51 which illustrates and describes its complete line of gas-oil, electric, and steam finishing equipment.

24. Zinc and Cadmium Dip

"Iridite," a quick dip process for improving corrosion resistance or as a paint base or final finish on all zinc or cadmium surfaces, is described in a four-page folder published by Allied Research Products, Inc., Baltimore 5, Maryland.

25. Polishing and Buffing Machines

Acme Straight Line Automatic Polishing and Buffing Machines are the subject of an eight-page folder distributed by the Acme Manufacturing Co., Detroit, Michigan.

26. Metal Cleaners

The Cowles Chemical Co., Cleveland, Ohio, has available a folder containing data sheets on its Metal Cleaners for every type of soil and operation.

27. Abrasive Grain

The Simonds Abrasive Co., Philadelphia 37, Pa., is issuing an illustrated data sheet on "Borolon" Aluminum Oxide Abrasive Grain for the polishing trade and general industrial uses.

28. Activated Carbon

The use of activated carbon for decolorizing, purifying, and deodorizing various liquids and electroplating solutions is described in literature available from the Darco Corp., New York 17, New York.

29. Spray Painting Information

"Hints on Finishing Economies," a 20-page booklet prepared by E. I. du Pont de Nemours & Co., Finishes Div., Wilmington 98, Del., covers the following subjects: proper paint temperature, correct air and fluid pressures, importance of paint viscosity, gun adjustment for correct spray pattern, proper handling and triggering of the spray gun, uniformity and thickness of the paint film, and causes and cures of common imperfections in spray finishing.

30. Boothcote Circular

A circular describing the use of Boothcote, a spray booth coating, is available from the Hygrade Food Products Corp., Boothcote Division, Buffalo 6, New York.

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431 Main St., Cincinnati 2, Ohio

I am interested in receiving the following literature reviewed in your February Issue.

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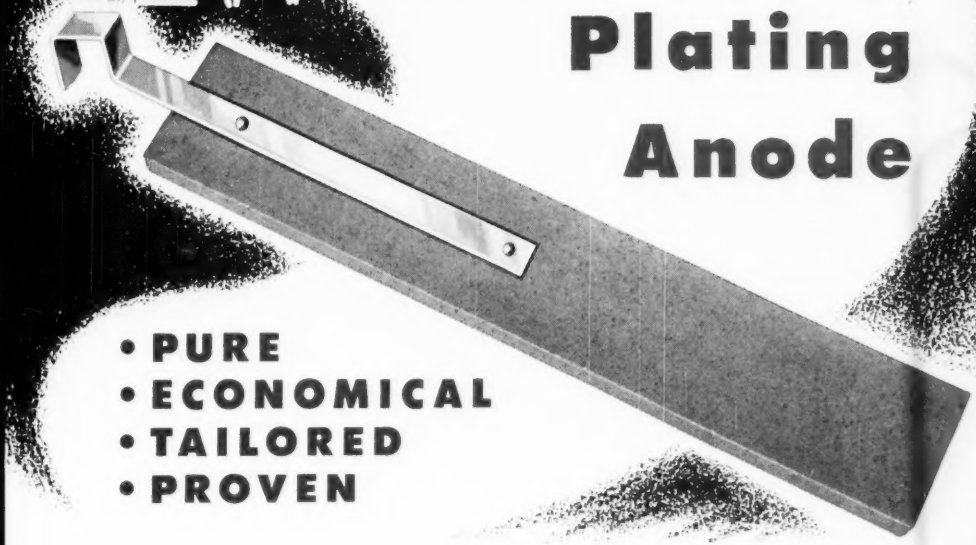
NEW LECTROCOP Plating Anode



- **PURE**
- **ECONOMICAL**
- **TAILORED**
- **PROVEN**

LOWEST COST FORM OF COPPER ANODE —plus better performance, versatility and safety . . . that's the new Wagner contribution for plating efficiency! You can now eliminate most of your oval anode headaches and gain these important money saving advantages:

- Quality is constant—99.98% *pure* electrolytic copper.
- Long steel hook is included, eliminating cost and labor of attaching threaded hooks.
- You may have any length or width to fit various tank sizes or work, tailored to your order, standard thickness approximately ½".
- Standard sizes are available to fit conventional anode bags.
- Long steel hook outlasts the copper, reducing danger of breakage of anode near surface.
- Efficiency is proven. Many leading plating plants and departments have already changed over to LECTROCOP electrolytically deposited anodes.
- Fabrication is immediate, in our Detroit plant. No long shipping delays.

For your convenience, LECTROCOP is shipped in a 250 pound package, steel strapped and palletized. Why not call in the Wagner Brothers representative in your area? He'll assist you in determining the correct LECTROCOP anode for your work. Or send for folder describing LECTROCOP and the other distinctive Wagner Anode Products.

Wagner BROTHERS INC.

432 MIDLAND DETROIT 3, MICH.

Wagner Bros., Inc., 432 Midland, Detroit 3, Michigan

Send ☐ **LECTROCOP Bulletin**
☐ **Anode Products Folder**
☐ **Name of representative in my area**

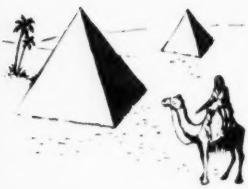
Name ..... **Title** .....

Firm .....

Address ..... **City** .....

Zone ..... **State** .....

WHAT DO *You* WANT in a DEGREASING SOLVENT?



UTMOST STABILITY and EASE of CONTROL?

Then you want PERM-A-CLOR—the *most highly stabilized* degreasing solvent. As to Control—simple titration *measures* service condition.

TOP ECONOMY?

For over-all degreasing economy and complete assurance even under most adverse conditions, *no other solvent equals PERM-A-CLOR.* For average use, TRIAD, the competitively priced stabilized trichlorethylene solvent, with Detrex service, will save you money.

HIGH SPEED?

PERM-A-CLOR and TRIAD are *unsurpassed in speed of degreasing.*

THOROUGH CLEANING?

It's PERM-A-CLOR and TRIAD again—for *perfect oil and grease removal* from all kinds of metal products.

SAFETY?

PERM-A-CLOR and TRIAD are *non-flammable, non-explosive* and truly safe for your equipment, products and personnel.

Write for complete information on these outstanding degreasing solvents and the advantages of Detrex free customer service.

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